AD NUMBER
AD909271
LIMITATION CHANGES
TO: **Approved for public release; distribution is unlimited. Document partially illegible.**
FROM: **Distribution authorized to U.S. Gov't. agencies only; Test and Evaluation; 24 APR 1973. Other requests shall be referred to Army Teat and Evaluation Command, Attn: AMSTE-SG-H, APG, MD 20005. Document partially illegible.**
AUTHORITY
USAAVSCOM ltr, 12 Nov 1973

U.S. ARMY

TEST & EVALUATION COMMAND

USATECOM PROJECT NO. 4-3-0250-11/12/13

PART ONE OF TWO PARTS

REPORT
OF THE ENGINEERING FLIGHT TEST STABILITY and CONTROL PHASE
OF THE
OH-4A HELICOPTER, UNARMED (CLEAN) and ARMED WITH THE XM-7 or XM-8 WEAPON SUBSYSTEM

AUGUST 1964

Distribution limited to U.S. Gov't. agencies only; Test and Evaluation; 24 APR 1973 Other requests for this document must be referred to army Test and Evaluation Comd. attn: AMSTE-SG-H, APG, Md. 21005

HEADQUARTERS

U.S. ARMY AVIATION TEST ACTIVITY

EDWARDS AFB, CALIFORNIA

FOR OFFICIAL USE ONLY

Aviation MTD

TECOM

23/25

U. S. ARMY AVIATION TEST ACTIVITY

6 PART ONE OF TWO PARTS
REPORT
OF THE ENGINEERING FLIGHT TEST
--STABILITY AND CONTROL PHASE--
OF THE
OH-4A HELICOPTER, UNARMED (CLEAN) AND ARMED
WITH THE XM-7 OR XM-8 WEAPON SUBSYSTEM. Part I.

16 USATECOM ~~PROJECT NO.~~ 4-3-0250-11/[redacted]

DA ~~PROJECT NO.~~ 1R141803D168

RODGER L. FINNESTEAD
Project Engineer

JOHN K. FOSTER
Major, U. S. Army, TC
Project Pilot

11 Aug 64

12 323 p.

AUTHENTICATED BY:

Richard J. Kennedy Jr.
RICHARD J. KENNEDY, JR.
Lieutenant Colonel, TC
Commanding

FOR OFFICIAL USE ONLY

036 470

mt

FOREWORD

Essential to an understanding of the results of aircraft testing is an understanding of the differences between engineering and service testing.

Engineering testing, using instrumented aircraft and calibrated instruments, can determine and record the exact performance, control response and limits, engine performance and power available, through accurate measurements and reduction of data to standard conditions. Thus, it is possible to determine when an aircraft is approaching or exceeding design limits or other specified criteria.

Service testing, using aircraft in standard configuration, results in a qualitative evaluation for user-type information. This information is based on a broad scope of pilot experience and technique provided by pilots ranging from those recently out of school to those with considerable field operational experience. The installed instruments and gauges are used to determine significant operating data. These instruments are not usually calibrated but represent typical instruments found in production helicopters. These instruments and gauges are verified for accuracy within acceptable tolerances but do not attain the precision provided by the calibrated equipment used for engineering testing.

The service test-pilot makes qualitative observations on only what he experiences during normal service flying. These observations are not correlated to such factors as the margin of control remaining or exact rates of control response. Exact measurements of such factors are necessarily the responsibility of the engineering test agency. Thus, service testing may show that the aircraft is suitable for performing a mission when, actually, flight has been performed close to, or within, control margins specified by military specifications. What may appear to be discrepancies between service and engineering test reports is actually the difference between qualitative and quantitative reporting

The Light Observation Helicopter evaluation is the first combined aircraft engineering and service test program that has resulted in coordination of reports and comparison of reports prior to procurement decision. Caution must be exercised, therefore, to preclude taking an item out of context in any one report to establish a particular position. Seeming inconsistencies can be reconciled only by examination of all reports with due regard to the specific conditions under which the test was accomplished.

TABLE OF CONTENTS

ABSTRACT

Stability and control flight tests were conducted on the OH-4A helicopter to determine the stability and control characteristics throughout the flight envelope for the unarmed (clean) and armed configurations. ~~Tests were~~ conducted by the U. S. Army Aviation Test Activity at Edwards Air Force Base, California and auxiliary sea level test sites near Bakersfield, California. Ninety-three test flights were conducted for 75:30 hours productive test time. These tests ~~were accomplished during the~~ period of 28 March ~~through~~ 31 June 1964. All test data were hand recorded from sensitive instruments or recorded on an oscillograph.

The quantitative test results and qualitative pilot's comments indicate that the OH-4A complied with most of the stability and control requirements of MIL-H-8501A. The stability and control characteristics were found to be generally satisfactory for all conditions tested, except for the following:

1. Maximum sideward and rearward flight speeds were longitudinally control limited when operating near the present forward longitudinal C.G. limit (Station 99.0).

2. The directional control system exhibited excessive mechanical play and the directional acceleration was too high.

The sideward and rearward speed limitations may decrease the mission capability and compromise safety of flight under certain conditions.

The armament tests on the OH-4A indicated that the helicopter was a stable weapons platform which exhibited satisfactory controllability characteristics. There are, however, certain shortcomings which should be corrected. These shortcomings are:

1. Excessive airspeed fluctuation during a firing sequence.

2. Structural damage to the gun mount when firing the XM-8 armament kit and an inadequate shell ejection area in the fairing assembly on the XM-7 armament kit.

The stability characteristics of the OH-4A were found to be generally better than those of the OH-13H and OH-23D helicopters.

(This page intentionally left blank)

PHOTO 1 – OH-4A

PHOTO 2 – OH-4A

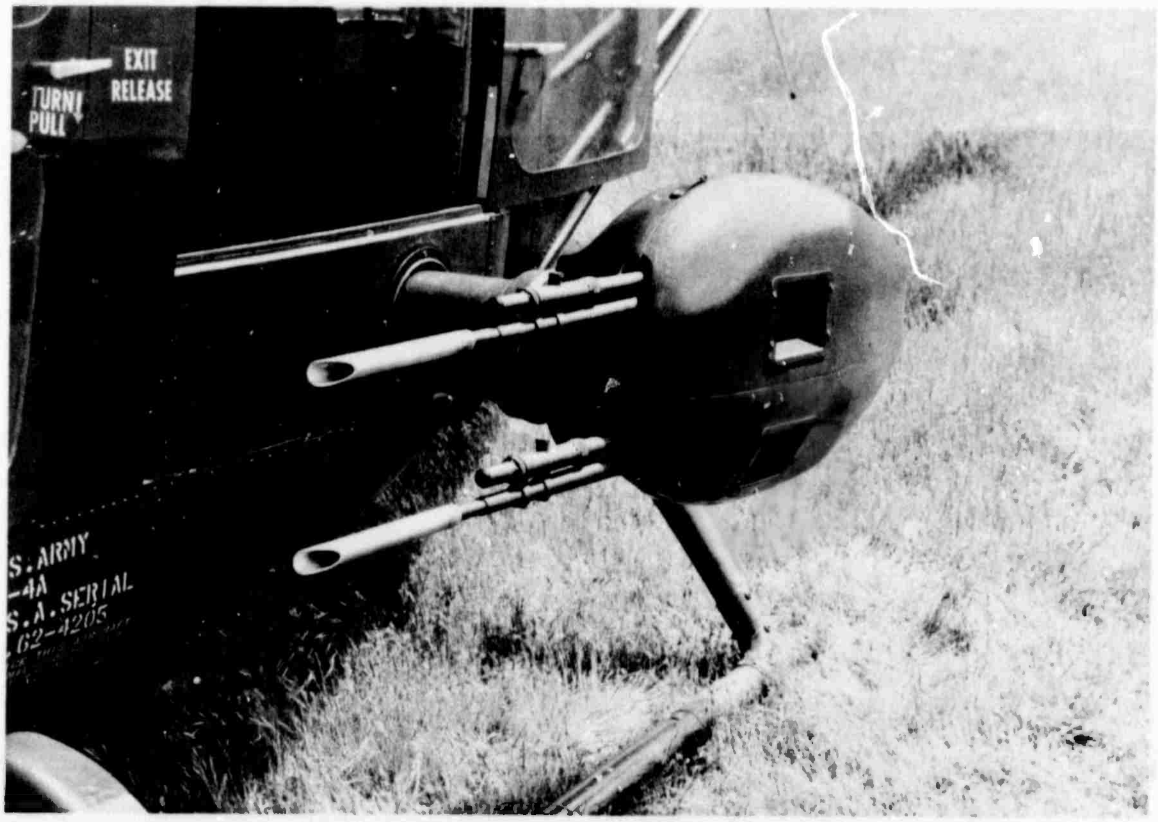


PHOTO 3 – XM-7 ARMAMENT KIT

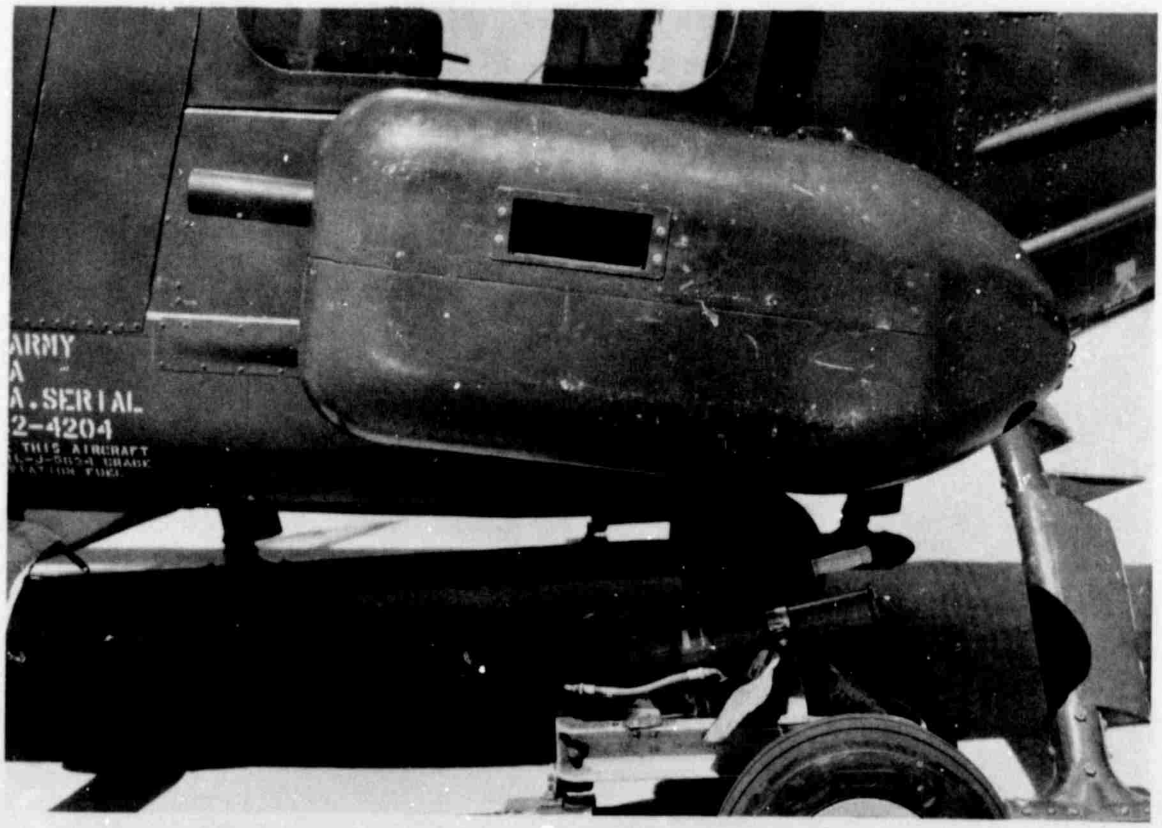


PHOTO 4 – XM-8 ARMAMENT KIT

SECTION 1 - GENERAL

1.1 REFERENCES

a. Military Characteristics, Light Observation Aircraft, TCTC Meeting 128, Item 3408, 20 May 1960.

b. Combat Development Objectives Guide (U) (CDOG), Paragraph 533a(1) as changed 25 March 1963.

c. Letter, AMCPM, Headquarters, U. S. Army Materiel Command, 12 March 1963, subject: "Test Directive, Evaluation of LOH," with 1 inclosure entitled "Test Directive for Flight Evaluation of OH-4/OH-5/OH-6 Aircraft."

d. Letter, AMSTE-BG, Headquarters, U. S. Army Test and Evaluation Command, 23 April 1963, subject: "Test Directive for Light Observation Helicopter."

e. Technical Development Plan, U. S. Army Transportation Materiel Command, Project No. L-R-1-41803-D-168, Light Observation Helicopter, 20 February 1963.

f. Military Specification MIL-H-8501A, "General Requirements for Helicopter Flying and Ground Handling Qualities," 7 September 1961.

g. Federal Aviation Agency Type Inspection Authorization No. CH666-2DM, 14 January 1964.

h. "OH-4A Helicopter Armament Kit -- Installation and Operation," Bell Helicopter Company, 28 February 1964.

i. Final Report of "Engineering Test of the Stability and Control Characteristics of the OH-13H Equipped with the XM-1 Armament Kit," U. S. Army Aviation Test Activity, April 1964.

j. Coordinated Plan of Test, USATECOM Project No. 4-3-0250-( ), "Military Potential Test of the Light Observation Helicopter (LOH) OH-4A, OH-5A, and OH-6A," U. S. Army Aviation Test Board, 17 September 1963.

1.2 AUTHORITY

Directive: Letter, AMSTE-BG, Headquarters, U. S. Army Test and

Evaluation Command (USATECOM), 23 April 1963, subject: "Test Directive for Light Observation Helicopter."

1.3 OBJECTIVES

The objective of this program was to conduct engineering stability and control flight tests of the Light Observation Helicopter (LOH) OH-4A to (a) confirm contractor compliance with the approved Army Military Characteristics for an unarmed (clean) and armed OH-4A helicopter, using Military Specification MIL-H-8501A as a guide, and (b) provide data to assist in selecting an LOH design for possible future production.

1.4 RESPONSIBILITIES

The U. S. Army Aviation Test Activity (USAATA) was designated Executive Test Agency for the confirmatory engineering tests in the LOH program and is responsible for test execution and test reporting of its assigned program phase.

1.5 DESCRIPTION OF MATERIEL

a. Technical Characteristics

The OH-4A design is a single main-rotor and anti-torque tail-rotor configuration. The cockpit configuration is two-place, providing seating for a pilot and an observer. Temporary (stowable) seating is provided in the rear (cargo) area for two passengers. The main-rotor blades can be manually folded and unfolded. The landing gear is of the skid type. A single "L"-shaped rubber-bladder fuel cell is located under the flooring in the passenger-cargo compartment and has a usable capacity of 76 gallons. The OH-4A is powered by an Allison T63-A-5 gas turbine engine, with a takeoff power rating of 250 shaft horsepower (SHP) at 6000 revoluations per minute (rpm). Conventional dual flight controls are incorporated. The pilot's collective pitch control stick incorporates the engine-starter button. The pilot's cyclic pitch control stick grip incorporates switches for armament selection, firing, hover/landing lights, and intercom or radio selection.

b. Physical Characteristics

The OH-4A has the following physical characteristics:

Rotor diameter	32 ft
Overall length	37 ft
Length (blades folded)	27 ft 2-1/2 in.

(Continued on next page)

Minimum width	-	5 ft. 10 in.
Maximum height	-	8 ft. 8-1/2 in.
Design gross weight	-	2572 lb.
Empty weight	-	1600 lb.
Overload gross weight	-	2900 lb.

c. OH-4A Armament

The XM-7 and XM-8 armament kits were provided with the OH-4A. The armament kits were mounted at different times on the left side of the aircraft.

(1) <u>XM-7 Armament Kit</u>

The XM-7 is a light helicopter armament kit consisting of two M-60C 7.62 mm machine guns vertically positioned in a single pod. These kits can be installed on the left or right side of the OH-4A, or on both sides simultaneously. The XM-7 basic sighting range is 500 meters. The M-60C has a firing rate of 600 round per minute. Using one can of ammunition for each kit (600 rounds), continuous firing time is approximately one minute. With a single kit installation (left side), the ammunition from both cans can be used and the firing time is increased to approximately two minutes. Fire coverage is controllable in elevation from 3-1/2 degrees above to 35 degrees below the helicopter waterline. With the left-side installation only, using four ammunition cans, the system weight is 375 pounds.

(2) <u>XM-8 Armament Kit</u>

The XM-8 is a light helicopter armament kit consisting of one M-75 40 mm grenade launcher. This kit is mounted on the left side of the OH-4A. The XM-8 basic sighting range is 400 meters and, like that of the XM-7, includes elevation control from 3-1/2 degrees above to 35 degrees below the helicopter waterline. The M-75 has a firing rate of 150 rounds per minute which gives a continuous firing time of 53 seconds. Normally, ammunition is carried in two ammunition cans which provide a total of 132 rounds. A single can installation with 77 rounds (30-second firing) can be used. This permits the right aft seat to be utilized for cargo, equipment, or a passenger. The system weight with the single ammunition can is 260 pounds.

The XM-7 and XM-8 armament kits are interchangeable on the left side of the helicopter. The right-side XM-7 kit can be installed with either the XM-7 or XM-8 installed on the left side of

the helicopter. These kits are attached to the cargo deck, which is a main fuselage structure. All attachment hardpoints are included in the basic airframe structure, and necessary wiring is included in the basic aircraft. The guns are encased in pods, and ammunition is routed from cans in the aft compartment through the mount structure to each gun. Ammo chuting is short, direct and not exposed.

The sight system is usable with either the XM-7 or XM-8 installation. Sighting information is presented visually for both pilot and observer and may be changed from the XM-7 to the XM-8 setting by a switch on the sight body.

Three axis Stability Augmentation Equipment (SAE) is provided as an integral part of the armament installation and includes a heading-hold feature that permits the pilot or observer to trim the helicopter, thus the guns, in azimuth.

Both armament systems require AC and DC power. The battery, generator and inverter will normally be "on" and the armament and SAE circuit breakers will be engaged.

1.6 BACKGROUND

a. Requirement

Paragraph 533a(1) of the Combat Development Objectives Guide (CDOG), 25 March 1963 (reference b), and the approved Military Characteristics (MC's) (reference a) describe the light observation helicopter as follows: "The light observation aircraft shall be a lightweight, reliable, easily maintainable, readily air transportable helicopter capable of performing the following missions: visual observation and target acquisition, reconnaissance, and command control. The helicopter will be of minimum size consistent with the requirement for a pilot and three passengers, or a pilot and 400 pounds of cargo. Reliability and frontline supportability shall be given primary consideration."

b. General

(1) In October 1959, the Office of Chief, Research and Development, Department of the Army, initiated an Army Aircraft Development Plan to develop firm guidance for Army aviation for the period 1960-1970. As part of this plan, three Army Study Requirements (ASR's) describing broad development objectives in the area of light observation, manned surveillance, and tactical transport were prepared. The ASR's were presented to industry at Fort Monroe, Virginia, on 1 December 1959.

(2) As a result of the ASR 1-60 study on Army light observation aircraft, a decision was made to use light observation helicopters and to phase light observation aircraft out of Army inventory. The Light Observation Helicopter (LOH) Design Competition was initiated on 14 October 1960 by a letter to industry from the Bureau of Weapons, U. S. Navy. The designs were evaluated jointly by the U. S. Army and U. S. Navy, and three designs were selected for prototype testing. The Army model designations for these helicopters are OH-4A, OH-5A and OH-6A.

(3) The contracts for "off-the-shelf" direct procurement were negotiated directly with the manufacturers. Contracts were awarded in November 1961 to each manufacturer for delivery of five prototype helicopters to be type certificated by the Federal Aviation Agency (FAA) in compliance with CAR, part 6. The Army had the option of accepting delivery before certification providing the FAA had issued a Type Inspection Authorization (TIA).

1.7 FINDINGS

At airspeeds above 35 knots calibrated airspeed (KCAS), the static longitudinal trim stability was positive (stable) for all flight conditions tested. At airspeeds below 35 KCAS, there was a slight longitudinal cyclic control position reversal that was not considered objectionable. Lateral cyclic control and directional control trim positions did not significantly change over the helicopter airspeed range. When the helicopter was loaded to an aft center-of-gravity (C.G.) location, the forward longitudinal cyclic control travel margin of 10 percent was reached at approximately 106 KCAS. As gross weight was increased from design to overload, the longitudinal cyclic control trim position moved slightly aft and the static trim stability became somewhat less positive. During climbing flight, longitudinal control position was forward of the level flight position approximately .3 inch and, during autorotation, was aft of the level flight position approximately 1 inch. The degree of positive trim stability was approximately the same in climbing flight as in level flight.

The static trim stability for the armed configuration showed little little change in the longitudinal and directional requirements. The resulting change in lateral C.G. required approximately 2 inches of right lateral cyclic displacement.

The static longitudinal trim stability of the OH-4A helicopter is greater than that of the OH-23D and less than that of the OH-13H in the speed range from 30 to 65 KCAS. The static trim stability of the OH-4A is considered to be adequate and satisfactory.

The static longitudinal collective fixed stability was generally positive (with no objectionable longitudinal control reversals encountered at the flight conditions tested). With an aft C.G. location,

the static longitudinal stability became less positive as trim airspeed was increased. At a forward C.G. location, the static stability became more positive with increasing airspeed above 60 KCAS. There was no significant gross weight effect on the static stability. There was a slight decrease in static longitudinal stability with increasing altitude.

The installation of the armament kits did not have a significant effect on the collective fixed static longitudinal stability.

The degree of collective fixed static trim stability of the OH-4A helicopter is generally less than that of the OH-13H and is considered better than that of the OH-23D, which exhibits negative stability. The degree of positive static longitudinal collective fixed stability exhibited by the OH-4A is considered to be satisfactory.

The static lateral-directional stability characteristics of the OH-4A were generally acceptable and positive effective dihedral was present for all conditions tested. There was, however, a slight directional control reversal between zero and 10 degrees right sideslip during level flight at low airspeed. This reversal was not considered to be objectionable. The static directional stability increased with airspeed and decreased with increasing altitude. Static directional stability was approximately the same for all gross weights. During autorotation, the effective dihedral was generally less than that for level flight and climb; however, it remained slightly positive.

Installation of the armament kits did not significantly affect the static lateral-directional flying qualities.

The degree of positive static lateral-directional stability displayed by the OH-4A is generally similar to the amount displayed by both the OH-13H and OH-23D.

Stabilized sideward flight to the left was determined to be limited by longitudinal control travel. This limit was observed to be particularly critical with the helicopter loaded near the forward C.G. location (Station 99.0). Sufficient control was available to permit right sideward flight up to 35 knots true airspeed (KTAS) under all loading conditions.

Rearward flight with the OH-4A was limited to approximately 10 KTAS by longitudinal cyclic control available when the helicopter was loaded to a forward C.G. (Station 99.5). Establishment of a forward C.G. limit of Station 101 would allow rearward flight to be accomplished up to 30 KTAS and meet the requirements of MIL-H-8501A.

With present C.G. limits, the OH-4A has less sideward and rearward flight capability than the OH-13H helicopter. Data were not available for comparison with the OH-23D.

The dynamic stability characteristics of the OH-4A were satisfactory for all conditions tested. The damping was high with the motions being essentially "deadbeat" or damped out in one cycle. As airspeed was increased,the damping decreased; consequently the stability was less positive. Increasing altitude and gross weight had little effect on the dynamic stability characteristics.

The dynamic stability for the armed configuration was found to be essentially the same as that for the clean configuration. The SAE slightly improved the dynamic stability in a hover.

The controllability of the OH-4A helicopter was sufficient and in the proper direction for all conditions tested. MIL-H-8501A was generally complied with; however, the directional control sensitivity and response was too high to allow good flying and handling qualities. This high directional control sensitivity and control response coupled with the mechanical play in the directional control system, resulted in frequent overcontrolling and difficulty in stabilizing in turbulent conditions. Longitudinal and directional coupling was present for lateral control inputs. Directional control inputs resulted in coupling about the longitudinal and lateral axes. These coupling effects increased in magnitude with increasing airspeed.

The controllability characteristics in the armed configuration were basically the same as those exhibited for the clean configuration. The SAE decreased the controllability by a small amount about all three axes.

The longitudinal and lateral controllability characteristics exhibited by the OH-4A were as good as, or better than, those displayed by the OH-13H and OH-23D helicopters.

The effectiveness of the OH-4A as a weapons platform was not influenced by any adverse stability and control contributions from firing the armament. The lateral C.G. was limited to 1.18 inches due to high airspeed transmission spike pounding. The structural vibratory loads induced by the firing tests were quantitatively judged to be higher with the XM-8 armament. The standard airspeed system was found to fluctuate ± 15 knots and was consequently inaccurate during a firing sequence. The major deficiency encountered with the XM-7 armament was frequent jamming of the top gun. This was caused by the insufficient shell casing exit area in the gun fairing. The XM-8 mounting assembly is presently unable to absorb the vibration and loads induced during a firing sequence.

Autorotational characteristics were good. With a sudden reduction in power, there was an immediate yaw to the left which was easily controllable. No pitching, rolling or other adverse characteristics were noted. There was sufficient rotor inertia to allow the collective pitch control to be held in the trim position for at least 2 seconds.

No adverse characteristics were noted in the armed configuration and the reaction to a sudden power loss was basically the same as for the clean configuration.

The cyclic and directional control breakout forces and force gradients did not comply with the requirements of MIL-H-8501A; however, the cyclic control forces were high enough to hold the controls in any given position. The directional control forces were inadequate and should be increased to comply with the requirements of MIL-H-8501A. The directional control system exhibited a certain amount of mechanical play which made the aircraft difficult to stabilize during low power and low airspeed flight conditions. There was mechanical cyclic-collective control coupling with the boost system both "on" and "off." This coupling caused the cyclic control to move forward as the collective control was raised and move aft as the collective was lowered. The collective stick position was not influenced by cyclic stick movement with the boost "on"; however, with the boost system "off," cyclic movement caused the collective to move. Although in violation of MIL-H-8501A, paragraphs 3.4.2 and 3.4.3, this coupling was small and was very easily overcome by the pilot either holding the control or using a small amount of friction.

1.8 CONCLUSIONS

None

1.9 RECOMMENDATIONS

None

2.0 INTRODUCTION

Stability and control tests were conducted on the OH-4A helicopter to determine the stability and control characteristics throughout the flight envelope specified in Federal Aviation Agency Type Inspection Authorization (FAA TIA) No. CH666-2DM, dated 14 January 1964. Tests with a XM-7 or XM-8 armament kit installed were conducted to determine the effect of these kits on stability and control. In addition, XM-7 and XM-8 firing tests were conducted to determine the aircraft's suitability as a weapons platform. Tests were conducted by the U. S. Army Aviation Test Activity at Edwards Air Force Base, California and at auxiliary sea-level test sites near Bakersfield, California. Ninety-three test flights were conducted for 75:30 productive flight hours. The tests were accomplished during the period of 28 March through 31 June 1964.

All stability and control tests were conducted at a rotor rpm of 394 (100 percent N_2) at the following conditions in addition to those specified in each sub-test:

Gross Weight	Density Altitude ft	Center of Gravity Location	Configuration
Design	5000	Aft (Sta. 106.0)	Clean
Design	5000	Fwd (Sta. 99.0)	Clean
Overload	5000	Aft (Sta. 106.0)	Clean
Design	10,000	Aft (Sta. 106.0)	Clean
Design	5000	Aft (Sta. 106.0)	Armed (XM-7 or XM-8)

All tests were conducted in non-turbulent atmospheric conditions so that the stability and control data would not be influenced by uncontrolled disturbances. The design gross weight and overload gross weight for the OH-4A are 2572 pounds and 2900 pounds, respectively. The longitudinal center-of-gravity (C.G.) envelope was Station 99.0 (forward) to Station 106.0 (aft) and the lateral limits were 3.0 inches right to 3.0 inches left of the helicopter centerline.

The armament tests (both firing and non-firing) were conducted at design gross weight at an aft C.G. location over a density altitude

range of 3000 to 5000 feet. The armament equipment was maintained and loaded by U. S. Army Aviation Test Activity personnel. Personnel from Springfield Armory, Springfield, Massachusetts, observed the firing tests in a consulting and advisory capacity.

The stability and control tests were conducted in the following sequence. The static stability tests were conducted first at the lower altitude and gross weight combinations. After a major portion of the static stability tests was completed, the dynamic and controllability tests were started. This sequence allowed the test program to be conducted in the safest and most logical manner.

The control rigging was checked prior to the first test flight to insure conformity with the manufacturer's specifications. At various times during the test program the control rigging was rechecked to determine if any change had occurred.

The stability and control characteristics of the OH-4A were checked for conformity with MIL-H-8501A, where applicable. In addition, a comparison with the OH-13H and OH-23D helicopters' stability and control characteristics was made where possible.

The test instrumentation used during this program was supplied, calibrated, installed and maintained by the Logistics Division of the U. S. Army Aviation Test Activity. The test instrumentation consisted of sensitive visual indicators and a 14-channel Midwestern oscillograph. A swivel type pitot-static airspeed system was used to determine airspeed, and fuel used was measured by a Potter flow meter installation. The total weight of the instrumentation was 116 pounds.

The airspeed and altitudes referred to in this report are calibrated airspeed (CAS) and density altitude (H_D) unless otherwise noted.

2.1 STATIC TRIM STABILITY

2.1.1 OBJECTIVE

The objectives of the tests were to determine the static trim stability and flying qualities as the trim airspeed was varied during climb, level flight and autorotation.

2.1.2 METHOD

The tests were conducted for the flight conditions listed in Section 2.0 ,"Introduction" and as specified in the following table, unless otherwise noted:

(See following page for Table)

Conditions	Airspeed Range KCAS
Climb	30 to 60
Level Flight	Approx. 20 to Vmax
Autorotation	20 to 45 (Clean Configuration Only)
Autorotation	20 to 60 (Armed Configuration Only)

Control positions and aircraft attitudes were recorded for each trim airspeed. The helicopter was stabilized at the trim airspeeds by varying the controls as required for the flight conditions.

2.1.3 RESULTS

Graphical test results are presented in Figures No. 1 through 7, Section 3, Appendix I.

2.1.4 ANALYSIS

2.1.4.1 Quantitative Engineering Analysis of Static Trim Stability

a. Clean Configuration

The static longitudinal trim stability was generally positive (stable) for all flight conditions tested. There was a slight longitudinal cyclic control position reversal below 35 knots calibrated airspeed (KCAS); however, the magnitude of the reversal was small and was not considered unsatisfactory. For all airspeeds above 35 KCAS, the cyclic control position moved forward with increasing airspeed, and there were no discontinuities. Lateral cyclic control and directional control variations with changes in airspeed were small with the controls near their center of travel at 100 KCAS.

As the C.G. location was changed from forward (Station 99.95) to aft (Station 105.80), the longitudinal cyclic control position moved forward approximately 2.0 inches. Extrapolation of the test data obtained at 5000 feet indicated that at an aft C.G. location (Station 105.80) the helicopter would be longitudinally control limited to 121 KCAS. Ten percent of the longitudinal control travel remaining appeared to occur at 106 KCAS. The forward C.G. location (Station 99.95) resulted in a slight increase in the low speed longitudinal control position reversal. Lateral and directional control position characteristics were similar for all C.G. locations except that at the forward C.G. location (Station 99.95) and at airspeeds below 35 KCAS there was apparently a change in tail-rotor effectiveness and more left pedal was required.

There were no significant cyclic or pedal control position changes as a function of gross weight. As gross weight was increased from a design to an overload condition, the longitudinal cyclic control position moved slightly aft and the static trim stability was somewhat less positive.

Longitudinal cyclic control position moved aft approximately 1 inch as the flight regime was changed from level flight to a steady-state autorotation. This longitudinal position change was present for all conditions tested. A slow transition from level flight to climb required the longitudinal control to be moved slightly forward approximately .3 inch. During climb the static trim stability was similar to that at level flight with slight control reversal below 35 KCAS. During autorotation, the static trim stability was positive and there were no discontinuities for conditions tested. As in level flight, moving the C.G. location either forward or aft during climb and autorotation,only shifted the position of the trim curve and did not change the basic trim stability characteristics.

b. Armed Configuration

Test results for the XM-7 and XM-8 armed configurations show the longitudinal and directional control static trim positions to be essentially the same as those found for the clean configuration. The change in lateral C.G. location with the armament installed, however, affected all flight conditions in a similar manner and required approximately 1.5 to 2.0 inches of right lateral cyclic displacement.

All control position changes for various flight regimes, altitude, and gross weight changes varied in the same manner as for the clean configuration.

With the longitudinal SAE actuator failed in the nose-up direction, a corresponding forward longitudinal control displacement was required to maintain a given attitude. This longitudinal SAE failure would limit the maximum airspeed with a 10 percent longitudinal control travel margin to 95 KCAS. No other SAE actuator failure would appear to limit the flight envelope.

2.1.5 QUALITATIVE PILOT'S COMMENTS ON STATIC TRIM STABILITY

a. Clean Configuration

The static flying qualities were good in most areas. There were no safety-of-flight conditions to be considered and the requirements of MIL-H-8501A, paragraph 3.2.1 were generally fulfilled. The longitudinal control position gradient was generally positive and a trim airspeed was easily maintained with a minimum of pilot effort.

Control forces and control harmony were satisfactory. Wearing a parachute placed the pilot forward in the seat, and the longitudinal control could move sufficiently aft to contact the pilot.

This was particularly noticeable at a forward (Station 99.95) C.G. location. Lateral cyclic, directional pedal and collective control position variations with airspeed were small and were not objectionable. The control reversal at 35 KCAS was noticeable but was not considered unsatisfactory.

b. Armed Configuration

Static flying qualities were similar for both armed configurations except that right lateral cyclic was required to compensate for the change in lateral C.G. location with the armament installed. This change in control position was not objectionable and the pilot could rapidly become accustomed to the new position.

2.1.6 COMPARISON OF THE STATIC TRIM STABILITY OF THE OH-4A AND THE OH-13H AND OH-23D

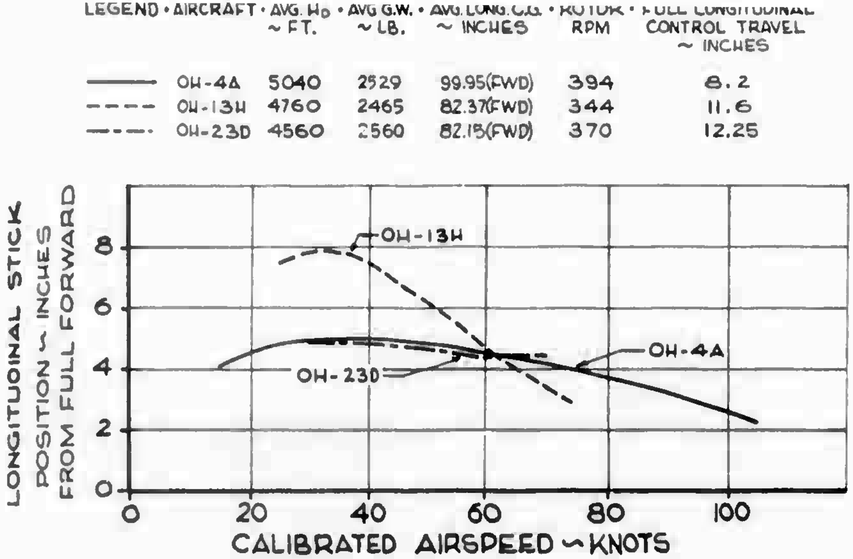
The static longitudinal trim stability of the OH-13H helicopter is considerably more positive than that for the OH-4A helicopter during climb, level flight and autorotation. The low airspeed longitudinal control reversal, however, is greater on the OH-13H. The airspeed at which this reversal occurs increases as the longitudinal C.G. is moved from an aft to a forward, whereas a change in longitudinal C.G. on the OH-4A helicopter would only slightly affect the low airspeed control reversal. The directional control required to stabilize the OH-4A was less than that for the OH-13H over the same airspeed range. In addition, smaller directional control requirements were required as the OH-4A entered autorotation. These smaller control requirements provided better control harmony and reduced pilot fatigue during extended flights.

The lateral control gradient is essentially the same for both the OH-4A and OH-13H helicopters. Increasing right stick was required as airspeed increased.

The static longitudinal trim stability on the OH-23D is slightly positive to neutral for all conditions compared, whereas the OH-4A was slightly positive. The directional and lateral control requirements are virtually the same as those for the OH-4A helicopter. The neutral longitudinal stability exhibited by the OH-23D requires the constant attention of the pilot to maintain straight and level flight. "Hands off" flying capabilities are practically non-existent for the OH-23D helicopter.

The static longitudinal trim stability of the OH-13H and OH-23D are graphically compared to that of the OH-4A helicopter in Figure A.

(See next page for Figure A)



2.2 STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

2.2.1 OBJECTIVE

The objective of the static longitudinal collective fixed stability tests was to measure quantitatively the helicopter static stability as airspeed was varied about a given trim airspeed.

2.2.2 METHOD

Static longitudinal collective fixed stability tests were conducted as specified for the flight conditions listed in Section 2.0, "Introduction" and for all altitudes, gross weights and C.G. conditions listed in the following table:

Condition	Trim Airspeed	Airspeed Range
Level Flight	35 KCAS	15 to 50 KCAS
Level Flight	.8 Vne	.6 Vmax to Vmax
Level Flight	Vmax (Clean Configuration Only)	.8 Vne to Vmax

The helicopter was trimmed at the specified level flight trim condition with the collective control fixed. The airspeed was then varied through the specified range by use of cyclic and pedal controls only. For each point the control positions and aircraft attitudes were recorded.

2.2.3 RESULTS

Graphical test results are presented in Figures No. 8 through 14, Section 3, Appendix I.

2.2.4 ANALYSIS

2.2.4.1 Quantitative Engineering Analysis of the Static Longitudinal Collective Fixed Stability

a. Clean Configuration

The static longitudinal collective fixed stability was generally positive (stable) with no objectionable longitudinal control reversals encountered for the flight conditions tested. At the aft longitudinal C.G. location (Station 105.7), the longitudinal collective fixed stability became less positive as the trim airspeed was increased. Extrapolation of the test data indicates that the longitudinal collective fixed stability could become neutral before a trim airspeed of 115 knots calibrated airspeed (KCAS) was reached. Lateral cyclic and pedal position variations with changes in airspeed about a given trim condition were small.

As the C.G. was moved to a forward location, the collective fixed stability became less positive at 35 KCAS and more positive as the trim airspeed was increased. There was little change in the lateral cyclic or directional control requirements with a change in longitudinal C.G. location.

As the gross weight was increased, the degree of stability decreased. At the overload gross weight, the stability became neutral at 100 KCAS and the aircraft became unstable at speeds in excess of 100 KCAS. There was a slight decrease in the longitudinal collective fixed stability as density altitude was increased from a density altitude of 5000 to 10,000 feet. This variation with increased altitude and gross weight was not objectionable since trim speeds of approximately 100 KCAS at 5000 feet and 87 KCAS at 10,000 feet were generally reached before the longitudinal stability became negative.

b. Armed Configuration

Test results for the armed configuration, both XM-7 and XM-8, show that the static longitudinal collective fixed stability characteristics were essentially the same as those of the clean configuration.

2.2.5 QUALITATIVE PILOT'S COMMENTS ON STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

a. Clean Configuration

The static longitudinal collective fixed stability was acceptable and generally positive for all trim conditions. The

helicopter was easy to trim at any airspeed and maintain this trim condition from 35 KCAS to 100 KCAS. When operating the aircraft near aft longitudinal C.G. limit, the longitudinal stability gradient became less positive as airspeed was increased. Very little longitudinal control movement was required to change airspeed under these conditions. The decrease in stability was not sufficient to affect the pilot's ability to stabilize and maintain a desired trim airspeed during flights in turbulent atmospheric conditions. There was no significant change in the lateral and directional control requirement as the airspeed was varied ± 10 KCAS from trim airspeed.

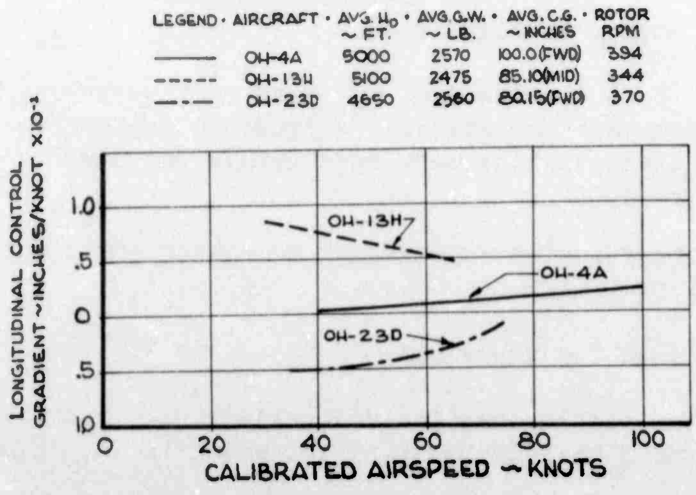
b. Armed Configuration

There was no significant change in the static longitudinal collective fixed stability with either the XM-7 or XM-8 weapon system installed. The flying qualities and the control requirements were essentially the same as for the clean configuration.

2.2.6 COMPARISON OF THE STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY OF THE OH-4A, AND THE OH-13H AND OH-23D HELICOPTERS

The static longitudinal collective fixed stability characteristics of the OH-13H are more positive than those of the OH-4A. The OH-4A, however, is generally positive in all areas tested. The comparison plot (Figure B) indicates that the stability of the OH-4A becomes more positive as airspeed increases while the OH-13H aircraft's longitudinal stability decreases with increasing airspeed. The OH-23D stability is negative over an airspeed range of 40 KCAS to 70 KCAS. This negative stability characteristic is in violation of MIL-H-8501A requirements and is considered unsatisfactory.

FIG. B
STATIC LONGITUDINAL
COLLECTIVE FIXED STABILITY



As airspeed is varied about the trim point, the directional control requirements of both the OH-13H and the OH-23D are greater than for the OH-4A. These larger control requirements result in poorer flying qualities since the pilot must make larger control corrections. This condition is most significant while cruising in turbulent atmospheric conditions.

2.3 STATIC LATERAL-DIRECTIONAL STABILITY

2.3.1 OBJECTIVE

The objectives of the static lateral-directional stability tests were to determine the static-directional stability and the dihedral effect throughout the flight envelope for both the clean and armed configurations.

2.3.2 METHOD

Static lateral-directional stability was measured by recording the amount of longitudinal, lateral and directional control and the resulting bank angle required to produce a given amount of sideslip angle. Static-directional stability was determined by the relationship between pedal position and angle of sideslip. Effective dihedral was determined from the lateral control relationship with sideslip angle. The tests were conducted for all conditions stated in Section 2.0, "Introduction", with the exception of the forward C.G. tests. The following airspeeds and flight conditions were utilized:

Flight Condition	Trim Airspeed
Climb	45 KCAS
Level Flight	35 KCAS & .8Vne
Level Flight	Vmax (Clean Configuration Only)
Autorotation	Vmin R/D (45 KCAS)
Autorotation	75 KCAS (Clean Configuration Only)

2.3.3 RESULTS

Graphical test results are presented in Figures No. 15 through 41, Section 3, Appendix I.

2.3.4 ANALYSIS

2.3.4.1 Quantitative Engineering Analysis of the Static Lateral-Directional Stability

a. Clean Configuration

The static lateral-directional stability characteristics were generally considered acceptable. The pedal control and lateral cyclic control required per degree of sideslip increased with increasing airspeed. Positive effective dihedral was present for all conditions.

During level flight a slight pedal control reversal was noted between zero degrees and 10 degrees right sideslip at 35 KCAS. The directional control requirements at 35 KCAS were positive but nonlinear as sideslip was increased from 10 degrees right to 45 degrees right sideslip and from zero degrees to 30 degrees left sideslip. At the same airspeed the directional stability became neutral or slightly negative for left sideslip angles greater than 30 degrees. The lateral cyclic control requirement was generally positive with additional left lateral cyclic displacement required with increasing left sideslip angle. The static directional stability increased as airspeed was increased and decreased as altitude was increased. A 10 percent control travel margin was available about all axes during the tests conducted.

The test data indicated that the static lateral-directional stability and effective dihedral were positive during maximum continuous power climbs for all conditions tested. During autorotations static directional stability and the dihedral effect decreased; however, they remained slightly positive. A 10 percent right pedal control margin at extreme left sideslip angles was not available during autorotation for any configuration tested. There was still enough directional control available, however, to accomplish low speed (25 KCAS) autorotational 360-degree pedal turns in the most critical direction (right).

b. Armed Configuration

Test results for both the XM-7 and XM-8 configurations showed the static lateral-directional stability to be more positive at zero and 15 degrees right sideslip than that found for the clean configuration. The change in lateral C.G. (1.25 inches left) with the armament installation introduced a requirement for additional right lateral control (Reference paragraph 2.1.4.1.b).

An SAE failure in the most critical mode (left roll) was not tested to determine if the lateral control travel would be limited. An SAE actuator failure in other modes should not limit any control travel.

2.3.5 QUALITATIVE PILOT'S COMMENTS ON STATIC LATERAL-DIRECTIONAL STABILITY

a. Clean Configuration

The static lateral-directional stability was generally satisfactory for all conditions tested. The dihedral effect was positive and was considered satisfactory. Bank angles were uncomfortable at the extreme sideslip angles.

The stability was weakest during low speed level flight (35 KCAS) and autorotation. The weak stability and mechanical play ("pedal slop") in the directional control system made it difficult to stabilize at zero or small angles of sideslip. This "pedal slop" was characterized by a small amount of mechanical play in both pedals. As a result, small pedal movements did not cause a control input to the tail rotor. In turbulence, a precise yaw attitude was difficult to maintain and the best technique was to maintain the pedals fixed and allow the aircraft to yaw through the small angles.

In a straight line autorotational descent with the sideslip indicator on the gyro horizon centered, the sideslip angle would be 7-10 degrees right sideslip. The directional stability increased with airspeed and at velocity never to exceed (Vne), nearly full pedal was required to obtain the limit sideslip angles.

b. Armed Configuration

Installation of the armament did not significantly change the flying qualities. With the left lateral C.G. location that resulted from the armament installation, there was a right lateral cyclic control requirement which placed the stick near the pilot's right knee. With a SAE actuator failed in the left roll mode, the right lateral cyclic control may be limited by contact with the pilot's leg.

2.3.6 COMPARISON OF THE STATIC LATERAL-DIRECTIONAL STABILITY OF THE OH-4A AND THE OH-13H AND OH-23D

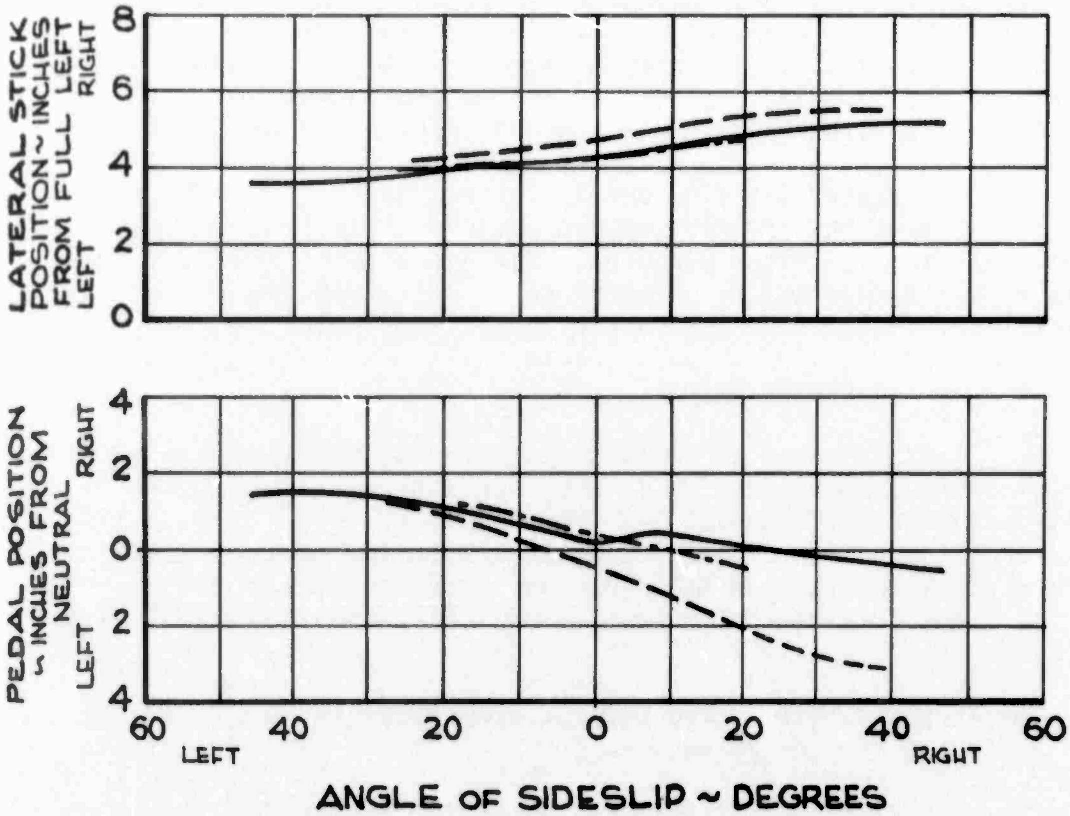
The static lateral-directional stability characteristics of the OH-4A, OH-13H and OH-23D helicopters cannot be compared on a common data basis. However, since the stability characteristics are normally not significantly changed with variations in longitudinal C.G. location, the following plot presents an adequate comparison of the helicopters, (See page 20 for Figure C). Both the OH-13H and OH-23D helicopters' static directional stability is stronger than that for the OH-4A. In addition, the OH-4A exhibits a reversal in the directional control requirement between zero and 10 degrees right sideslip while the OH-13H and OH-23D helicopters' directional control requirements are positive for the entire sideslip range.

FIG. C
STATIC LATERAL- DIRECTIONAL STABILITY

LEGEND	AIRCRAFT	CAS ~KNOTS	AVG. H_p ~FT.	AVG. G.W. ~LB.	AVG. C.G. ~INCHES	ROTOR RPM
———	OH-4A	35	5285	2625	105.8(AFT)	394
- - - -	OH-13H	35	5100	2490	84.7(MID)	344
—- - —	OH-23D	35	5075	2570	80.1(FWD)	370

• *FULL CONTROL TRAVEL*

AIRCRAFT	LATERAL	PEDAL
OH-4A	9.5	5.2
OH-13H	12.9	8.4
OH-23D	7.2	5.5



The OH-4A, OH-13H and OH-23D helicopters' lateral control gradients are essentially the same. This indicates that the effective dihedral characteristics are positive and similar for all three helicopters.

2.4 SIDEWARD AND REARWARD FLIGHT

2.4.1 OBJECTIVE

The objective of the sideward and rearward flight test was to determine the control required to hover in winds for various C.G. configurations. Tests were also conducted in the armed configuration to determine any adverse flying qualities resulting from this armament installation. Additional tests were conducted in the armed configuration with the SAE failed in the most critical directions to reveal any effect on control power available.

2.4.2 METHOD

Cross wind and tail wind hovering conditions were simulated by flying the helicopter sideward (left and right) and rearward in calm air. A calibrated pacer ground vehicle was used to record speed as the helicopter was stabilized at the various conditions listed in the following table:

Flight Condition	Gross Weight	Density Altitude	Airspeed Range	Center of Gravity	Lateral Center of Gravity
Sideward	Design	1000 ft	30 KTAS lt &rt	Fwd(100.8)	2.77 in. lt
Sideward	Design	1000 ft	30 KTAS lt &rt	Fwd(101.0)	Mid
Sideward	2350 lb	1000 ft	30 KTAS lt &rt	Fwd(99.5)	1.20 in. lt (approximate)
Rearward	Design	1000 ft	30 KTAS rearward to 20 KTAS fwd	Fwd(101.0)	Mid
Rearward	2350 lb	1000 ft	30 KTAS rearward to 20 KTAS fwd	Fwd(99.5)	1.20 in. lt (approximate)

The resulting control positions and attitudes were recorded for each stabilized trim airspeed.

2.4.3 RESULTS

Graphical test results and time histories are presented in Figures No. 42 through 48, Section 3, Appendix I.

2.4.4 ANALYSIS

2.4.4.1 Quantitative Engineering Analysis of Sideward and Rearward Flight

a. Sideward Flight

With a symmetrical lateral loading at a forward C.G. location (Station 101.2) there was sufficient lateral control travel available to attain the sideward true airspeed limit of 20 KTAS specified in Reference g. A subsequent revision of Reference g, 21 May 1964, allows a maximum sideward speed of 30 KTAS; however, tests were not conducted to this higher airspeed. Extrapolation of the test data presented in Figure No. 42, Section 3., Appendix I, indicates that the maximum airspeed which can be obtained with a 10 percent lateral control travel margin will be approximately 30 KTAS, both right and left. The lateral control position versus sideward speed curve is generally nonlinear and positive. Sideward flight to 30 KTAS is not limited by directional control. The static directional stability is positive with right pedal being required to maintain heading during left sideward flight and left pedal for sideward flight to the right.

There were no significant changes in the longitudinal position as airspeed was varied from 20 KTAS left to 20 KTAS right sideward flight. The longitudinal control position moved slightly aft as sideward airspeed was increased in either direction.

While sufficient directional control was available to maintain the airspeed previously discussed, the poor stability in the area of translational airspeed (8-15 KTAS) to the left required many small rapid directional control inputs to maintain a stabilized attitude. In addition, there were requirements for small longitudinal and lateral control inputs. As the lateral C.G. was moved from a mid lateral to a left lateral location, this instability increased in magnitude.

There were large undamped but controllable oscillations about all axes with a left lateral C.G. of 1.18 inches.

As the left lateral C.G. was increased to 2.77 inches, these oscillations became uncontrollable in left sideward flight for an airspeed range of 8-15 KTAS. No instability existed during

sideward flight to the right. This asymmetrical loading caused the lateral control position to move approximately 2.0 inches right; however, there was still sufficient right lateral cyclic control available to obtain 30 KTAS to the right. Directional control characteristics from 8 KTAS left to 30 KTAS right were the same for the clean configuration.

With the asymmetrical lateral C.G. loading stated above, the aircraft did not meet the requirements of MIL-H-8501A, paragraph 3.3.2.

As the longitudinal C.G. was moved forward from Station 99.5, the lateral and directional control requirements were the same. However, sideward flight to the left was limited to approximately 17 KTAS by aft longitudinal control available.

Allowing a 10 percent control travel margin to overcome aircraft attitude changes during turbulence reduced the left sideward airspeed to 14 KTAS. The longitudinal control requirements in right sideward flight were much less than for left sideward flight and 30 KTAS could be achieved with a 10 percent control travel margin.

In the forward longitudinal C.G. configuration (Station 99.5), with the SAE failed to the full nose down position, the maximum sideward flight speeds that could be obtained were limited. Failure of the longitudinal actuator to the forward position introduced a requirement for additional aft cyclic control and limited the maximum left sideward speed to approximately 14 KTAS. A 10 percent control travel margin decreased the maximum left sideward speed to 10 KTAS. Sufficient longitudinal control was available for a 30-KTAS sideward speed to the right. A lateral SAE failure shifted the lateral control position approximately .90 inches but did not restrict the sideward speeds for any condition tested.

A right directional SAE failure required an additional 1 inch of left pedal control. The directional control limit was reached at 31 KTAS right sideward flight and a 10 percent control travel margin restricted the speed to 29 KTAS.

To obtain stabilized sideward flight of 30 KTAS both to the left and right, the longitudinal and left lateral C.G. locations had to be limited to Station 101.2 and 1.18 inches respectively.

b. Rearward Flight

With a symmetrical lateral loading and a forward C.G.

location, (Station 101.0), there was sufficient longitudinal control available to attain the rearward speed limit of 20 KTAS specified in Reference g. Extrapolation of the test data presented in Figure No. 47, Section 3, Appendix I, indicates that 30 KTAS rearward flight could be achieved with a 10 percent longitudinal control margin.

A significant increase in aft longitudinal control was required as the aircraft passed through translational lift (8-13 KTAS) in rearward flight; however, this control requirement was positive in direction and the magnitude was not excessive. No discontinuities in the lateral or directional control requirements were present and a 10 percent control margin was available for both axes at all conditions tested.

With an asymmetrical lateral loading of 1.17 inches left of centerline and a forward C.G. location at Station 99.5, stabilized rearward flight speed was limited to 10.5 KTAS by the aft longitudinal control available. The 10 percent control travel margin requirement in MIL-H-8501A, paragraph 3.2.1 further limits rearward speed to 9.0 KTAS.

The longitudinal control position was displaced .80 inches aft with a forward longitudinal C.G. change from Station 101.0 to 99.5 . This loading condition increased the requirement for aft longitudinal cyclic control in the area of rearward translational airspeed. The asymmetrical C.G. loading required an additional 2.0 inches of right lateral control; however, a 10 percent lateral control travel margin was available at a rearward speed of 12 KTAS. The directional requirements in rearward flight were virtually the same for both the symmetrical and asymmetrical loading conditions.

With the longitudinal SAE actuator failed in this aircraft, nose-down position resulted in an additional aft longitudinal control requirement and this limited the maximum rearward flight speed to 9.5 KTAS. A 10 percent control travel margin further decreased the maximum rearward speed to 7.5 KTAS. SAE actuator failures in other modes would not further restrict the rearward flight capabilities of the helicopter.

2.4.5 QUALITATIVE PILOT'S COMMENTS ON SIDEWARD AND REARWARD FLIGHT

2.4.5.1 Qualitative Pilot's Comments on Sideward Flight

During hover and transition to sideward flight, the helicopter was free from objectionable shake, vibration, or roughness. This meets the requirements of MIL-H-8501A, paragraph 3.3.2.

In sideward flight to the left at a forward C.G. loading there was an area of yaw instability at approximately 8-15 KTAS. This yaw instability in the area of translational lift indicated that it would be difficult to hover the aircraft in a 90 degree cross wind between 8-15 KTAS. With a near symmetrical lateral C.G. location this yawing oscillation could be controlled and, once beyond 15 KTAS, the aircraft was stable in yaw and the flying qualities were satisfactory.

With the aircraft quartered slightly into the wind, there was no instability and this critical airspeed range could be flown without yawing oscillations. There were no difficulties encountered in right sideward flight at this loading configuration.

Stabilized sideward flight to the left with a left lateral C.G. of 2.77 inches could not be accomplished in the airspeed range from 8-15 KTAS because of a divergent oscillation in yaw. The aircraft was flown in left sideward flight above the 8-15 KTAS critical area and evaluated qualitatively. The helicopter could be controlled through the critical area by quartering into the wind until past the area of translational lift, then turning back to 90 degrees with the wind. The yawing oscillation was not present beyond 15 KTAS. It would be impossible to accomplish a hover in a 90-degree cross wind of 8-15 KTAS at this loading configuration. No instability was encountered in right sideward flight at this loading configuration out to the limits flown. At the extreme left lateral loading configuration there could be a right lateral control restriction because the cyclic stick was very close to the pilot's leg at 30 KTAS in right sideward flight. When the left lateral loading was reduced to 1.17 inches and a forward C.G.(Station 99.5), the aircraft was controllable out to 30 KTAS. There was still an instability in yaw in the area of 8-15 KTAS but the helicopter was controllable.

With a forward longitudinal C.G. loading and a lateral C.G. of 1.18 inches left, the maximum left sideward flight limit was 17 KTAS with the longitudinal control on the aft stop. This did not allow a sufficient envelope for normal operation. No control limits or adverse flight characteristics existed in right sideward flight at this loading configuration.

An SAE failure decreased the cyclic control available by approximately .6 inch and the directional control by approximately 25 percent. When the failure was in the critical direction, all the previously described limits were reduced.

2.4.5.2 Qualitative Pilot's Comments on Rearward Flight

a. Clean Configuration

The flying qualities during rearward flight were good;

however, the maximum rearward flight speed was limited by some C.G. conditions. With a forward C.G. loading at Station 101.0 there was adequate longitudinal control to reach 20 KTAS rearward. With a forward C.G. loading at Station 99.5 there was insufficient longitudinal control to exceed 10 KTAS rearward. The forward C.G. loading should be limited to Station 101.0 to provide a practical flight envelope. An increase in aft longitudinal control was noted as the aircraft passed through the translational lift speed range (8-15 KTAS). It was easy to stabilize the helicopter and maintain a trim airspeed in rearward flight. There were no lateral or directional control deficiencies at this most adverse C.G. loading.

b. Armed Configuration

At a forward longitudinal C.G. loading (Station 99.5) and a lateral loading of 1.17 inches left of centerline, aft longitudinal cyclic control available limited rearward flight to 11 KTAS in both the XM-7 and XM-8 configurations. A 10 percent control travel margin or a longitudinal SAE actuator failure further limited the rearward flight speed at this loading configuration.

Lateral and directional control requirements at this loading configuration were satisfactory throughout the limits flown.

2.4.6 COMPARISON OF SIDEWARD AND REARWARD FLIGHT OF THE OH-4A AND THE OH-13H AND OH-23D

2.4.6.1 Sideward Flight

There is no sideward flight data available for the OH-23D helicopter. The sideward flight characteristics for the OH-4A and OH-13H helicopter are presented in Figure D (See page 27).

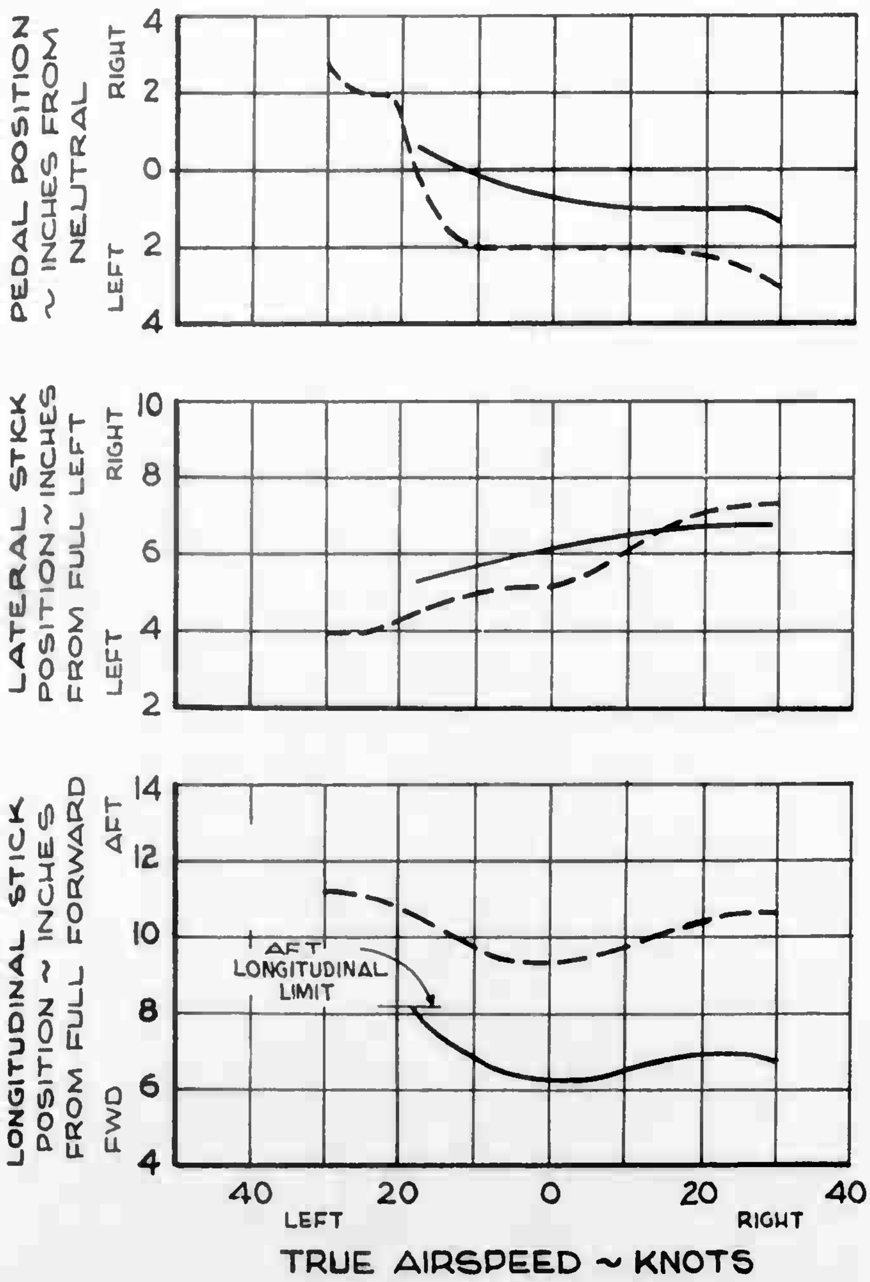
The OH-4A is longitudinally control limited to an airspeed of less than 19 KTAS in sideward flight to the left when operating at the present maximum forward C.G. location (Station 99.0). The OH-13H has sufficient control to achieve 30 KTAS in both directions. The longitudinal control gradient is the same for both helicopters over the airspeed range tested. The nonlinear and inconsistent lateral control requirement on the OH-13H is undesirable, whereas the OH-4A has a relatively constant lateral control position gradient. The directional control gradient on the OH-4A is positive with no large or negative discontinuities over the airspeed range tested. The OH-13H helicopter's directional control requirement is also positive but there is a sharp increase in the directional control gradient as the helicopter passes through translational lift in right sideward flight.

2.4.6.2 Rearward Flight

The rearward flight characteristics for the OH-4A and OH-13H helicopters are presented in Figure E, (See page 28).

FIG. D
CONTROL POSITIONS IN SIDEWARD FLIGHT •

LEGEND	AIRCRAFT	AVG. H_D ~ FT.	AVG. G.W. ~ LB.	AVG. C.G. ~ INCHES	ROTOR RPM
———	OH-4A	1360	2360	99.4(FWD)	394
– – – –	OH-13H	1250	2650	81.4(FWD)	355

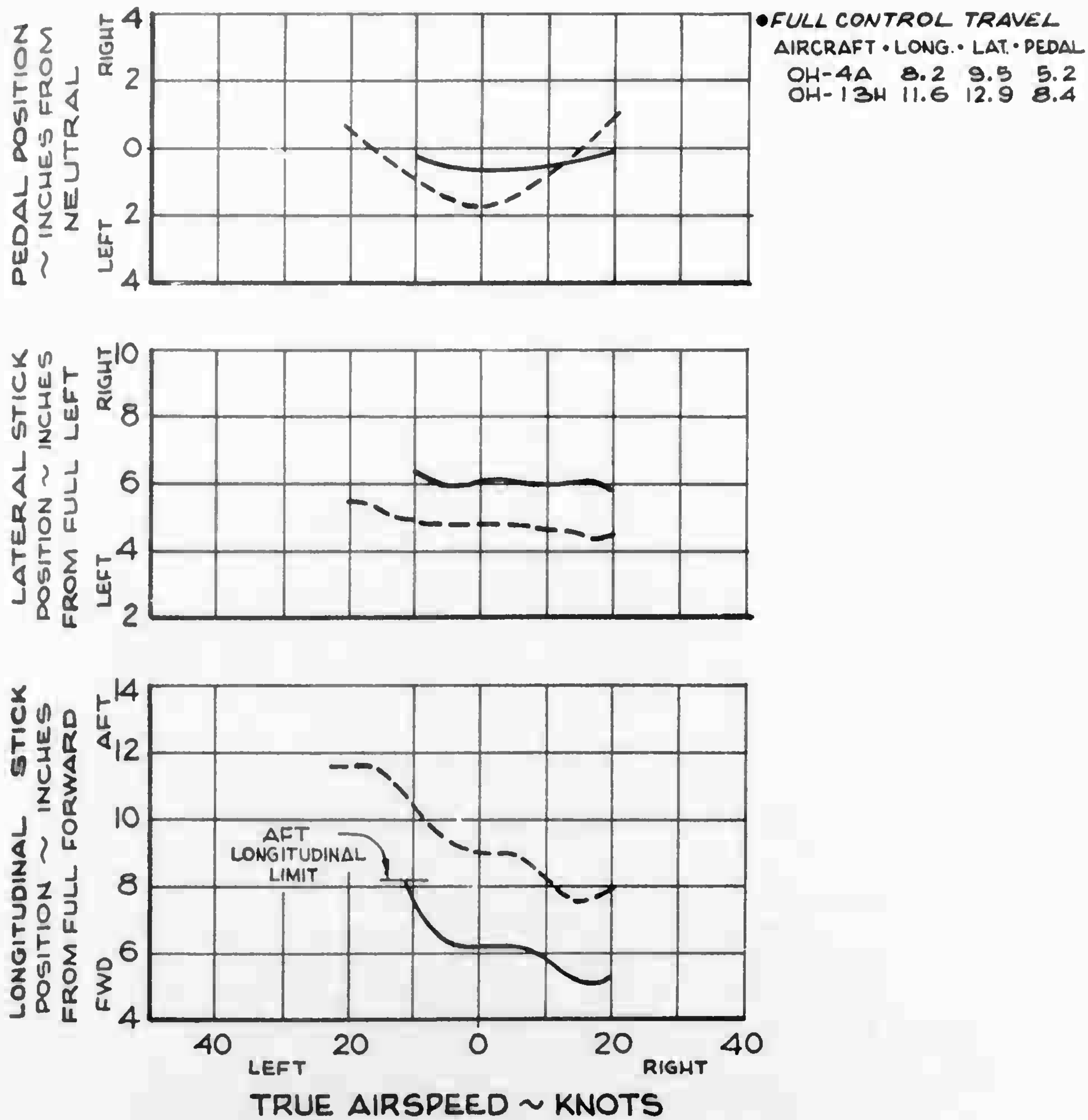


● *FULL CONTROL TRAVEL*

AIRCRAFT	LONG.	LAT.	PEDAL
OH-4A	8.2	9.5	5.2
OH-13H	11.6	12.9	8.4

FIG. E
CONTROL POSITION
IN REARWARD FLIGHT

LEGEND	AIRCRAFT	AVG. H_D ~ FT.	AVG. G.W. ~ LB.	AVG. C.G. ~ INCHES	ROTOR RPM
———	OH-4A	1670	2555	101.0(FWD)	394
- - - -	OH-13H	1250	2455	83.3(FWD)	355



No rearward flight data is available for the OH-23D helicopter. When at a forward C.G. condition, aft longitudinal control available limits the OH-4A rearward flight speed to 11 KTAS and the OH-13H to 19 KTAS. The longitudinal and lateral control position gradients are essentially the same for both the OH-4A and OH-13H helicopters. The directional control requirements of the OH-4A are less than for the OH-13H.

2.5 DYNAMIC STABILITY

2.5.1 OBJECTIVE

The objective of the dynamic stability tests was to determine the dynamic stability characteristics of the OH-4A throughout its flight envelope. Tests were also conducted to evaluate the change in dynamic stability as a result of the two armament kit installations. Tests with the armament kits installed were conducted with the SAE both "on" and "off" to evaluate its effect on dynamic stability.

2.5.2 METHOD

The dynamic stability characteristics were evaluated by recording the helicopter motions that resulted from pulse-type control inputs. A control fixture was used to obtain more uniform inputs. The input was accomplished by rapidly displacing the control for the desired axis approximately one inch, holding the control in this position for approximately 1.0 second, then rapidly returned it to the trim control position. This trim control position was then held until the helicopter stabilized or recovery action was necessary. Control positions, aircraft attitudes, and angular rates were recorded for each pulse control input. The following tests were conducted for the conditions stated in Section 2.0, "Introduction":

Condition	Trim Airspeed
Hover (IGE	Zero
Climb	45 KCAS
Level Flight	35 KCAS and .8Vne
Level Flight	Vmax (clean configuration only)
Autorotation	45 KCAS

2.5.3 RESULTS

Time histories are presented in Figures No. 49 through 91, Section 3, Appendix I.

2.5.4 ANALYSIS

2.5.4.1 Quantitative Engineering Analysis of Dynamic Longitudinal Stability

a. Clean Configuration

The longitudinal dynamic stability characteristics were similar for all flight conditions. Damping was high and the pitching motion was essentially damped out in 1 cycle for aft control disturbances and "deadbeat" for forward control disturbances. As airspeed increased damping decreased and the stability was less positive. As the C.G. was moved forward, the longitudinal oscillations became more damped for all flight conditions tested. The requirements of MIL-H-8501A, paragraph 3.2.11 were generally satisfied by the longitudinal dynamic stability characteristics exhibited by the test aircraft.

The C.G. normal acceleration became concave downward approximately .2 second following a 1-inch aft longitudinal control displacement. The maximum maneuvering load factor listed in Reference b was not reached during the tests. The maneuvering stability characteristics displayed by the test aircraft complied with the requirements of MIL-H-8501A, paragraphs 3.2.11.1 and 3.2.11.2.

There were no adverse dynamic couplings present during the longitudinal dynamic stability tests. At no time during these tests was the aircraft control-limited during the recovery phase of the maneuver.

b. Armed Configuration

Test results for the armed configurations showed the longitudinal dynamic stability to be essentially the same as that found for the clean configuration. The helicopter was never control-limited during recovery from a longitudinal dynamic stability maneuver. The SAE "on" was found to have little or no effect on longitudinal dynamic stability characteristics.

2.5.4.2 Quantitative Engineering Analysis of Dynamic Lateral Stability

a. Clean Configuration

Lateral disturbances resulted in a "deadbeat" to highly damped lateral oscillation for all flight conditions tested. Damping was highest during hover at a forward C.G. location. The damping and lateral stability of the aircraft decreased slightly with increased airspeed and altitude. Longitudinal and directional

coupling was present for an aft C.G. loading; however, this coupling effect decreased as the C.G. was moved to a forward location. These small pitch and yaw oscillations were highly damped for all flight conditions tested except during hover. In hover, a right lateral pulse caused the helicopter to roll right, pitch down and then yaw right while a left lateral pulse caused a left roll, pitch up and yaw left. These attitude changes could be easily controlled and were not objectionable. Increasing altitude had little effect on the lateral and directional coupling.

b. Armed Configuration

The lateral dynamic stability characteristics in both the XM-7 and XM-8 configurations were found to be basically the same as those exhibited in the clean configuration.

When the helicopter was at a left lateral C.G. of 1.25 inches, and at airspeeds greater than 85 knots, abrupt right lateral cyclic control motions caused the transmission centering spike (Part No. 206-030-508-3) to contact the spike cradle. This was a metal-to-metal contact and clearly heard and felt by the crew of the aircraft.

With the SAE operating the dynamic lateral stability was not improved except during hover. The SAE, however, did reduce the directional and longitudinal coupling that was present following a lateral disturbance.

2.5.4.3 Quantitative Engineering Analysis of Dynamic Directional Stability

a. Clean Configuration

A directional pulse to the right in a hover resulted in a right yaw and the helicopter stabilized on a new heading. A pulse to the left yawed the helicopter to the left. Following this initial yaw, there was a right yaw which was not consistent. In some cases, the helicopter would stabilize at the trim heading; and in other cases, it would continue to yaw right. The reason for this inconsistency was the undesirable mechanical play in the directional control system.

Dynamic directional stability in level flight was positive. The stability deteriorated somewhat as airspeed was increased and the C.G. location was moved forward.

Following a pulse-type directional control input, the helicopter yawed in the direction of the control input then oscillated

about the trim point with no change from the trim heading. The oscillation was damped to a small value within 1-1/2 cycles.

Dynamic coupling was encountered in the form of small heavily damped longitudinal and lateral oscillations. This coupling was more prominent at a forward C.G. and increased airspeeds. It was not significant during any of the level flight conditions tested. High altitude and heavy gross weight did not increase the coupling effect.

The dynamic directional stability characteristics encountered in climb and autorotation were essentially the same as those during level flight. The longitudinal and lateral coupling was greater during climb than during autorotation.

b. Armed Configuration

The dynamic directional stability for the armed configurations was basically the same as that for the clean configuration. With the SAE "on" during hover, the directional stability was improved and the aircraft would return to the trim heading and attitude. While hovering, the dynamic coupling was also decreased by the SAE. The SAE had no apparent effect on the damping or stability characteristics during forward flight.

2.5.5 QUALITATIVE PILOT'S COMMENTS ON DYNAMIC STABILITY

2.5.5.1 Qualitative Pilot's Comments on Dynamic Longitudinal Stability

a. Clean Configuration

Longitudinal pulses resulted in a highly damped pitching oscillation. During climb and low speed flight there was a small dynamic coupling evidenced by a tendency to yaw right with a pitch-up and yaw left with nose-down pitching. This coupling was not noticeable at higher airspeeds and was not objectionable in any case.

The normal acceleration characteristics were good with very little load factor change for a relatively large disturbance.

b. Armed Configuration

With the SAE "off", the longitudinal dynamic stability characteristics with both the XM-7 and XM-8 configurations were the same as those for the clean helicopter.

When the SAE was "on", dynamic longitudinal stability was slightly improved by the additional damping provided by the system.

This improvement was most noticeable during autorotation and low speed level flight.

2.5.5.2 Qualitative Pilot's Comments on Dynamic Lateral Stability

a. Clean Configuration

Lateral pulses resulted in a highly damped oscillation. There was very little lateral-directional coupling and the characteristics were very similar for all test conditions.

b. Armed Configuration

The dynamic lateral stability characteristics of both the XM-7 and XM-8 configurations were the same as those for the clean configuration with the SAE "off."

When the SAE was "on", dynamic lateral stability was slightly improved by the additional damping provided by the system. This improvement was most noticeable during autorotation and low speed level flight.

2.5.5.3 Qualitative Pilot's Comments on Dynamic Directional Stability

a. Clean Configuration

Pedal pulses resulted in a highly damped yawing motion for all conditions. The directional oscillation introduced a small heavily damped complementary roll oscillation. All motions were essentially damped to zero in 1 cycle with no residual oscillations. There was a small pitching oscillation which was nose down for right yaw and nose up for left yawing motions. This pitching motion was small and heavily damped.and was present at all airspeeds. High gross weights and altitudes did not introduce any adverse stability characteristics.

b. Armed Configuration

With the SAE "off," the dynamic directional stability characteristics with both the XM-7 and XM-8 configurations were the same as those for the clean configuration.

The heading hold portion of the SAE system produced a rapid response to the yaw rate. This rapid response and the strong corrective input were of sufficient magnitude to often cause the attitude to overshoot the trim position. For some conditions this appeared to decrease the stability and cause a resulting oscillation.

2.5.6 COMPARISON OF THE DYNAMIC STABILITY OF THE OH-4A AND THE OH-13H AND OH-23D

2.5.6.1 Dynamic Longitudinal Stability

The longitudinal dynamic stability characteristics of the OH-4A are better than those exhibited by the OH-13H and OH-23D helicopters. The pitching motion is more highly damped and the resulting attitude changes are smaller for the OH-4A. This stronger positive dynamic stability contributes significantly to the good overall longitudinal flying qualities of the OH-4A.

2.5.6.2 Dynamic Lateral Stability

The OH-4A data show higher lateral damping than data for the OH-13H and OH-23D for a lateral disturbance. In general there is less lateral-directional coupling present. This reduces the "Dutch Roll" type of oscillation encountered during turbulent flight conditions.

2.5.6.3 Dynamic Directional Stability

The dynamic stability characteristics are similar for the OH-4A, OH-13H and OH-23D. At high speed, the damping is slightly higher for the OH-13H than for the OH-4A. The lateral-directional coupling resulting from a directional pulse is smaller for the OH-4A helicopter. This decrease in coupling reduces the pilot effort required to fly the helicopter in unstable atmospheric conditions.

2.6 CONTROLLABILITY

2.6.1 OBJECTIVE

The objective of the controllability tests was to determine the maximum accelerations and rates that result per inch of rapid step control input. Additional tests were conducted to investigate any controllability changes contributed by the armament installations.

2.6.2 METHOD

The controllability was evaluated by recording the motions that resulted from step-type control inputs. A control fixture was utilized to control the magnitudes of the step inputs. The step inputs were accomplished by rapidly displacing the control to the desired position, then holding the control in this position until the maximum rate was reached or recovery action was necessary. The tests were conducted for each control axis. Control positions, aircraft attitudes, and rates were recorded for each step input.

The controllability tests were conducted at the following trim airspeeds for the conditions specified in Section 2.0

"Introduction", with the exception of the forward C.G. loading:

Condition	Airspeed
Hover	Zero
Climb	45 KCAS
Level Flight	35 KCAS and .8 Vne
Level Flight	Vmax (Clean Configuration Only)
Autorotation	Vmin R/D 45 KCAS

The controllability tests for the armament configurations were performed with the SAE both "on" and "off."

2.6.3 RESULTS

Test results are presented graphically in Figures No. 92 through 189, Section 3, Appendix I.

2.6.4 ANALYSIS

2.6.4.1 Quantitative Engineering Analysis of Longitudinal Controllability

a. Clean Configuration

(1) Longitudinal Control Sensitivity

The longitudinal control sensitivity ($deg/sec^2/in.$) of control displacement was similar for all flight regimes (hover, climb, level flight and autorotation). The maximum acceleration for the longitudinal axis was usually reached in approximately .50 second. The C.G. normal acceleration at 98 KCAS was 1.60 g's for a 1-inch aft step and 0.55 g's for a 1-inch forward step. The time required to reach these normal acceleration values was approximately 2 seconds. This complied with the requirements of MIL-H-8501A, paragraph 3.2.11.1. The longitudinal sensitivity was relatively constant for all airspeeds. The maximum variation in control sensitivity occurred at design gross weight and a density altitude of 5000 feet where the value increased from 8 $deg/sec^2/in.$ to 11 $deg/sec^2/in.$ as airspeed was varied from zero to 98 KCAS (Reference Figure No. 92, Section 3, Appendix I). The longitudinal control sensitivity was 8 to 9 $deg/sec^2/in.$ (Reference Figure No. 92, Section 3, Appendix I) from hover to Vmax for all other weight and altitude conditions tested. The control sensitivity for climb and autorotation was found to be essentially the same as that recorded during level flight.

(2) Longitudinal Control Response

Following the longitudinal control input, the

resulting angular velocity was almost immediate and in the proper direction. The angular velocity then increased in a normal manner. The angular velocity trace became concave downward approximately .4 second following the control input. This exceeded the minimum requirements of MIL-H-8501A, paragraph 3.2.11.1(b).

The time required to reach the maximum rate varied from 1.6 seconds in a hover in-ground-effect (IGE) to 1.0 second at 98 knots calibrated airspeed (KCAS) in level flight. The helicopter was generally found to be more responsive to an aft step than to a forward step for all conditions except hover IGE. This is a desirable characteristic and the magnitude of this variation was small and was not considered significant.

During a hover IGE at design gross weight, the response was 9.5 deg/sec/in. (Reference Figure No. 103, Section 3, Appendix I). As the gross weight was increased to overload gross weight, the response increased to 11.5 deg/sec/in. (Reference Figure No. 103, Section 3, Appendix I).

In level flight, the control response decreased at the higher airspeeds and was 6.4 deg/sec/in. (Reference Figure No. 103, Section 3, Appendix I) at 98 KCAS for a density altitude of 5000 feet with a design gross weight loading. Increasing the density altitude from 5000 to 10,000 feet reduced the response by 11.5 percent.

Longitudinal control response characteristics during climb and autorotation were nearly the same as those in level flight at a similar airspeed.

(3) Angular Pitch Displacement

The angular pitch displacement (deg/in.) was basically the same for all conditions tested. In all cases the longitudinal control input caused a pitch attitude change in the proper direction. The longitudinal displacement continued to increase until recovery action was necessary. The pitch displacement was approximately 4.0 deg/in. of stick deflection for a design gross weight and a density altitude of 5000 feet. This value complied with the minimum requirements of MIL-H-8501A, paragraph 3.2.14. A change in altitude had no effect on the angular pitch displacement.

The recovery from the attitudes resulting from the step inputs was easily accomplished and at no time were the control stops encountered.

b. Armed Configuration

The longitudinal controllability characteristics in the armed configuration were basically the same as those exhibited for the clean configuration. The times required to reach the maximum accelerations and rates were also the same. The SAE decreased the controllability by a small amount; however, the angular pitch displacement was still sufficient to comply with the requirements of MIL-H-8501A, paragraph 3.2.13.

2.6.4.2 Quantitative Engineering Analysis of Lateral Controllability

a. Clean Configuration

(1) Lateral Control Sensitivity

Lateral control sensitivity was found to be essentially the same for all conditions. The maximum angular acceleration for a lateral step control input was reached in less than 1/2 second. The characteristics of the angular acceleration curve complied with MIL-H-8501A, paragraph 3.3.16. The lateral control sensitivity was 19 deg/sec^2/in. (Reference Figure No. 125, Section 3, Appendix I) for all flight regimes, with no significant variations indicated as altitude, gross weight and airspeed were changed. The angular acceleration was immediate and in the proper direction within 0.2 second after the control displacement.

(2) Lateral Control Response

There was no objectionable or excessive delay in the development of angular velocity in response to a lateral control displacement. This fact satisfied the requirements of MIL-H-8501A, paragraph 3.3.16. The time required to reach the maximum roll rate was 0.85 second for all conditions. The lateral control response was the same for both left and right control inputs.

While hovering IGE at design gross weight the lateral response was 13.0 deg/sec/in. (Reference Figure No. 136, Section 3, Appendix I), which was below the 20 deg/sec/in. maximum limit stated in MIL-H-8501A, paragraph 3.3.15. Increasing the gross weight from design to overload did not change the control response characteristics.

The control response decreased from 13.0 deg/sec/in. at a hover IGE to 9.5 deg/sec/in. (Reference Figure No. 136, Section 3, Appendix I) at 40 KCAS for design gross weight and a density altitude of 5000 feet. Increasing gross weight showed a

slightly higher response at 40 KCAS. At a density altitude of 10,000 feet the response was a constant 11.0 deg/sec/in. for an airspeed range of 35 KCAS to 86 KCAS.

Lateral control response during climb was basically the same as that for level flight at the same airspeed. In autorotation, the control response was 20.0 percent less than for other flight regimes at an airspeed of 45 KCAS.

A longitudinal-directional coupling was present for all conditions tested. Right yaw and a pitch-down accompanied a right lateral step. This coupling was encountered in all flight regimes and became stronger as airspeed was increased.

(3) Angular Roll Displacement

The angular roll displacement resulting from a lateral cyclic step input was in the proper direction. The roll displacement of 12.0 deg/in. at overload gross weight met the requirement of MIL-H-8501A, paragraph 3.3.18.

A lateral control input during hover caused an angular displacement of approximately 11.0 deg/in. This angular roll displacement increased to 12.0 deg/in. (Reference No. 147, Section 3, Appendix I) at overload gross weight. There was sufficient angular displacement to comply with the minimum requirements of MIL-H-8501A, paragraph 3.3.18.

In level flight the angular roll displacement decreased to a minimum of 7.0 deg/inch (reference Figure No. 147, Section 3, Appendix I) at 40 KCAS then gradually increased to 10 deg/inch (reference Figure No. 147, Section 3, Appendix I) at 98.0 KCAS for design weight and a density altitude of 5000 feet. Increasing the gross weight to the overload condition caused a slight increase in the angular roll displacement at 35 KCAS and a decrease at 100 KCAS. The altitude effect was insignificant with the roll displacement having a value of 8.0 deg/in. at 35 KCAS and 8.5 deg/in. at 86 KCAS (Reference Figure No. 147, Section 3, Appendix I).

The angular roll displacements during climb and autorotation were found to be basically the same as those found for level flight.

b. Armed Configuration

The lateral controllability was found to be essentially the same as that for the clean configuration. The angular displacement at high airspeed, however, was greater to the left than to the right. With the SAE "on" the lateral control sensitivity, response and angular roll displacement were decreased by a small amount for all flight conditions but were still considered good. The angular roll displacement was sufficient to comply with MIL-H-8501A, paragraph 3.3.18.

2.6.4.3 Quantitative Engineering Analysis of Directional Controllability

a. Clean Configuration

(1) Directional Control Sensitivity

During a hover IGE at design gross weight and a density altitude of approximately 1000 feet, directional angular acceleration was 82 and 64 deg/sec^2/in. (Reference Figure No. 158, Section 3, Appendix I) for a left and right pedal input, respectively. At the overload gross weight, the sensitivity decreased to 69 for left and 54 deg/sec^2/in. (Reference Figure No. 158, Section 3, Appendix I) for right pedal inputs.

For a level flight airspeed of 35 KCAS, the sensitivity decreased to 48 deg/sec^2/in. (Reference Figure No. 158, Section 3, Appendix I) for design gross weight and a density altitude of 4800 feet. Increasing the airspeed to 99 KCAS further decreased the sensitivity to 38 deg/sec^2/in. (Reference Figure No. 158, Section 3, Appendix I). An increase in gross weight to the overload condition did not significantly change the sensitivity. As density altitude was increased to 10,000 feet, the directional control sensitivity decreased to 38 deg/sec^2/in. (Reference Figure No. 158, Section 3, Appendix I) at 35 KCAS and remained the same for all airspeeds up to 92 KCAS.

Directional control sensitivity during climb and autorotation was found to be essentially the same as that for similar level flight conditions.

(2) Control Response

A directional step co.:rol input resulted in an immediate angular yawing velocity in th proper direction. The yaw rate characteristics complied with MIL-H-8501A, paragraph 3.3.16.

The time required to obtain the maximum yaw rate varied from a maximum of 1.10 seconds at 35 KCAS to 0.6 second at Vmax. The helicopter was generally found to be more responsive for left than for right pedal inputs. This difference in response was small for all flight conditions except hover and was not considered objectionable.

The maximum directional control response in a hover IGE could not be obtained. Although the directional control input was held for approximately 3 to 5 seconds, the yaw rate continued to increase and the maximum was not achieved before recovery action was necessary. For this reason, the yaw rate was measured at 1/2 second after the control input. The angular velocity during a hover at design gross weight and a density altitude of

approximately 1000 feet was 26 and 22 deg/sec/in. (Reference Figure No. 168, Section 3, Appendix I) at 1/2 second after left and right pedal inputs, respectively. Increasing gross weight to the overload condition had little effect on the directional response.

Increasing the level flight airspeed decreased the directional control response. The angular velocity at design gross weight and a density altitude of 4800 feet was 28 deg/sec/in. at 35 KCAS and decreased to 8 deg/sec/in. (Reference Figure No. 168, Section 3, Appendix I) at 99 KCAS. A change in gross weight and density altitude had little to no effect on the directional response characteristics during level flight. The maximum angular yawing velocity resulting from directional control inputs during climb was slightly less than that obtained in level flight.

Directional response during autorotation was higher than that observed during level flight. As density altitude was increased, the directional response decreased. Increasing the gross weight had no effect.

Longitudinal-lateral coupling was present for all conditions tested. The resulting motion for a left pedal step input was a yaw left followed by a slight pitch up; then as the yawing motion to the left continued, the helicopter pitched down and rolled left. The coupling effect resulting from a right directional step was a yaw right followed almost immediately by a roll right and pitch down. The coupling became stronger as the airspeed was increased.

(3) Angular Directional Displacement

The angular directional displacement resulting from a step input was positive for all flight conditions tested. The minimum directional displacement complied with MIL-H-8501A, paragraph 3.3.5. The angular directional displacement was found to be essentially the same for all conditions tested.

A 1 inch directional control input during hover caused an angular displacement of 29 deg/in. pedal movement at a design gross weight and a density altitude of approximately 1000 feet. The directional displacement increased to 35 deg/in. pedal movement (Reference Figure No. 180, Section 3, Appendix I) as the gross weight was increased to the overload configuration.

The yaw displacement in level flight decreased with airspeed and was 20 deg/in. at an airspeed of 35 KCAS and 14 deg/in. (Reference Figure No. 180, Section 3, Appendix I)at 99 KCAS. An increase in gross weight had little effect on the directional displacement during level flight but an increase in density altitude caused the yaw displacement to decrease.

b. Armed Configuration

The directional controllability for the armed configurations was essentially the same as that found for the clean configuration. With the SAE "on" the directional control sensitivity response and angular yaw displacement were decreased slightly.

2.6.5 QUALITATIVE PILOT'S COMMENTS ON CONTROLLABILITY

a. Clean Configuration

The longitudinal control sensitivity and control response were satisfactory and the characteristics were similar for all the conditions tested. The pitching motion resulting from a longitudinal input was in the proper direction and there was no objectionable delay prior to the angular acceleration. The longitudinal control sensitivity and response were sufficient for good maneuvering characteristic during hover. The characteristics were essentially unchanged as airspeed increased and there was no tendency to overcontrol at the high airspeeds. The normal C.G. acceleration characteristics were good at high speed and the limit load factors were never approached. The control system effectively prevented any feed-back forces from the rotor and there were no stick forces associated with high speed maneuvering.

Lateral control sensitivity and response were good. Following a control input the rolling motion was immediate and in the proper direction. The rate characteristics were good. Following the control input, rate of roll increased rapidly to a maximum value and maintained this value until recovery was initiated. This is an excellent feature which assisted the pilot in rolling the aircraft to a desired attitude precisely. There was a strong lateral-directional coupling with a yaw immediately following the rolling motion. There was a tendency for the helicopter to pitch down with both left and right lateral control inputs. This longitudinal coupling is not desirable. The lateral-directional maneuvering characteristics were very good and comply with the requirements of MIL-H-8501A, paragraphs 3.3.8, 3.3.9.1 and 3.3.9.2. A lateral control input resulted in well coordinated turns and there was no requirement for directional control inputs. Although weaker at low speeds, these lateral-directional stability characteristics were satisfactory for all flight conditions. The lateral flying qualities were also satisfactory during climb and autorotation.

The high directional control sensitivity and control response were objectionable. These characteristics, coupled with the "pedal slop" in the control system, resulted in frequent overcontrolling and difficulty in stabilizing during turbulent conditions. This was most apparent during hover and low speed forward flight. There was very little rolling from the directional control input; however, the characteristic pitch-down with right yaw and pitch-up with left yaw were present. The severity of the pitching increased

with airspeed and was most objectionable at high speed.

b. Armed Configuration

The controllability characteristics for both the XM-7 and XM-8 configurations about all 3 axes were the same as for the clean configuration. With the SAE "on" there was a slight decrease in controllability. This decrease in controllability did not subtract from the good over-all flying qualities and maneuverability characteristics of the helicopter.

2.6.6 COMPARISON OF CONTROLLABILITY OF THE OH-4A AND THE OH-13H AND OH-23D

The longitudinal and lateral controllability characteristics exhibited by the OH-4A are as good as, or better than, those displayed by the OH-13H and OH-23D. The directional controllability characteristics of the OH-4A are inferior to those of the OH-13H and OH-23D helicopters because of the helicopter's high sensitivity and response in a hover. The representative values of each helicopter are found in Figures F and G on pages 43 and 44.

2.7 ARMAMENT FIRINGS

2.7.1 OBJECTIVE

The objectives of the tests were to determine the effects of the armament on the basic helicopter controllability during a firing sequence and to evaluate the SAE contribution to the flying qualities.

2.7.2 METHOD

The effect of the armament was obtained by recording the motions that resulted from a firing sequence. The firings were conducted from a stabilized condition and the firing sequence was normally 2 to 4 seconds in duration. During some of the firings a stabilized condition was maintained by applying the necessary control inputs. In other cases, the controls were fixed and the helicopter was allowed to respond freely to any moments contributed by the armament. All control positions, aircraft attitudes and rates were recorded for each firing. The tests were conducted on both armament kits at the following conditions:

(See page 45 for Table)

FIG. F

CONTROL SENSITIVITY COMPARISON

Aircraft	Approximate Density Altitude ft	Approximate Gross Weight lb	Rotor rpm	Approximate Center of Gravity in.
OH-4A	5000	2570	394	105.0 (aft)
OH-13H	5000	2500	344	85.0 (mid)
OH-23D	5000	2500	355	82.7 (mid)

		PITCH		ROLL		YAW	
Aircraft	Airspeed KCAS	Sensitivity deg/sec^2/in.	Time to Maximum Acceleration sec	Sensitivity deg/sec^2/in.	Time to Maximum Acceleration sec	Sensitivity deg/sec^2/in.	Time to Maximum Acceleration sec
OH-4A	Hover IGE	8.0	.60	19.0	.40	82.0	.50
	92	10.5	.60	20.0	.40	38.0	.25
OH-13H	Hover IGE	11.0	.43	15.0	.33	35.0	.47
	65	13.0	.42	16.5	.36	23.0	.35
OH-23D	69	13.5	.59	27.5	.37	48.5	.26

FIG. G

CONTROL RESPONSE COMPARISON

Aircraft	Approximate Density Altitude ft	Approximate Gross Weight lb	Rotor rpm	Approximate Center of Gravity in.
OH-4A	5000	2570	394	105.0 (aft)
OH-13H	5000	2500	344	85.0 (mid)
OH-23D	5000	2500	355	82.7 (mid)

		PITCH		ROLL		YAW	
Aircraft	Airspeed KCAS	Response deg/sec/in.	Time to Maximum Rate sec	Response deg/sec/in.	Time to Maximum Rate sec	Response deg/sec/in.	Time to Maximum Rate sec
OH-4A	Hover IGE	9.5	1.60	13.0	.85	26.0	*
	92	8.0	1.10	13.0	.85	19.0	.80
OH-13H	Hover IGE	6.3	1.96	7.2	.86	34.0	+
	65	6.0	1.11	6.7	.95	9.0	.87
OH-23D	69	17.5	1.51	9.7	.69	23.5	.86

* Yaw rate measured at 1/2 second after pedal step input

\+ Yaw rate measured at 1 second after pedal step input

Armament Kits' Test Conditions

Flight Conditions

Rearward Flight (IGE)

Sideward Flight (left and right IGE)

Hovering Flight (IGE)

Transition from Hover to Forward Flight (IGE)

Transition from Forward Flight to Hover (IGE)

Level Flight (0 deg sideslip)
35 KCAS, 50 KCAS, 92 KCAS and 105 KCAS

Level Flight (Yawed), 35 KCAS,
50 KCAS, 92 KCAS and 105 KCAS

Accelerated Flight at a Trim Airspeed
of 92 KCAS at the maximum C.G. normal
acceleration demonstrated by the contractor

These tests were all conducted with guns elevated full up (3.5 degrees) and depressed full down (35 degrees) for both SAE "on" and "off."

During the firing tests, air samples were collected to determine the degree of cockpit air contamination from the gases expelled by the armament.

2.7.3 RESULTS

Time histories illustrating the helicopter response during the firings are presented for each armament installation in Figures No. 193 through 240, Section 3, Appendix I.

2.7.4 ANALYSIS

2.7.4.1 Quantitative Engineering Analysis of XM-7 and XM-8 Armament Firings

a. XM-7 Configuration

The change in controllability (SAE "on" or "off") as a result of the firing, was very small for all conditions tested.

In a hover the helicopter tended to yaw left 2 to 3 degrees during the initial firing, then remain steady as the firing sequence was continued. This characteristic was evident for all conditions tested. With the guns rotated full down (35 degrees) there was a small (3 to 4 degrees) right roll present.

The strong lateral-directional stability of the helicopter effectively reduced the rolling and yawing tendency as airspeed was increased.

b. XM-8 Configuration

The effect of the armament firing on the helicopters controllability (SAE "on" or "off") was very small for all conditions tested. While hovering with the XM-8 firing when elevated to the full-up position (3.5 degrees) the aircraft yawed left approximately 3 to 4 degrees, rolled right and pitched up 2 to 3 degrees. This attitude stayed constant during the remainder of the firing sequence. Increasing airspeed tended to damp these motions and there was essentially no reaction at 105 KCAS (Vne). The reaction to the XM-8 firing, in a hover with the elevation 35 degrees down, was to yaw left 2 to 3 degrees, roll right 1 to 2 degrees and pitch down 1 to 2 degrees. Increasing the airspeed greatly reduced the motion resulting from the firing sequence.

c. Cockpit Contamination

During the armament firing tests the cockpit was checked for carbon monoxide (CO) contamination. The CO level was acceptable for all conditions tested. Even though the CO content was low; however, there was a strong gas odor present. The cockpit should be checked for other toxic gases, such as nitorgen oxide (NO_2) and ethyl mercoptan (C_2H_5SH).

2.7.5 QUALITATIVE PILOT'S COMMENTS ON ARMAMENT FIRINGS

a. XM-7 Configuration

During the initial firing test, it was found that when the left lateral C.G. location exceeded 1.30 inches, the transmission centering spike contacted the spike cradle during high speed forward flight and during normal maneuvering flight. This contact transmitted unknown structural loads to the aircraft and the vibration was disconcerting to the pilot. To eliminate the spike contact the helicopter was ballasted so that the left lateral C.G. did not exceed 1.30 inches for all subsequent firing tests.

The SAE effectively corrected for any aircraft movements contributed by the guns firing. During high speed and maneuvering flight it was very easy to get "on target" and maintain the desired flight condition with a minimum of pilot effort. The good basic stability of the helicopter provided a stable firing platform and the small improvement afforded by the SAE is questionable. The heading-hold feature of the SAE allowed the pilot to maneuver the aircraft easily to a desired heading without making control inputs. The SAE was generally reliable; however, a hardover encountered during a firing mission would result in a sudden control requirement and difficulty in maintaining accurate fire.

Frequent jamming of the upper gun occurred frequently. This was caused by the size of the shell casing exit area in the gun fairing which was too small and caused the spent shell casings to jam the weapon. The jamming sequence was believed to occur as follows:

(1) The spent shell casings accumulated in the exit chute and ricocheted back into the gun breech area.

(2) The gun feed mechanism simultaneously fed an unfired round into the breech.

(3) The spent casings and the unfired round jammed the breech and barrel area.

In one instance, the jammed shell casing was found backward in the breech area. As an interim measure, the gun fairing was removed. After the removal of the fairing, over 7000 rounds were fired without a malfunction of the type described.

During the firing test the debris (shell casings, misfired rounds and ammunition belt links) from the weapons was sufficiently clear of the aircraft. The ejection pattern was such that the material fell down and away from the aircraft. While firing, the ejected material came nearest the aircraft during a left rolling pull-up.

The standard airspeed system was found to be inaccurate during a firing sequence. The airspeed indicator fluctuated ±15 KIAS. This condition was attributed to the change in the airflow around the pitot-static port.

b. XM-8 Configuration

The flying qualities were basically the same as with the XM-7 armament system.

The structual vibratory loads induced by the firings were not quantitatively investigated. The vibrations were qualitatively judged to be higher with the XM-8 than with the XM-7 armament system.

Two torque tube mount assemblies of the XM-8 system were damaged by vibration loads to the point where firing could no longer be conducted safely. Cracks and fractures were also encountered on the ammunition mounting rack assembly.

2.8 AUTOROTATIONAL CHARACTERISTICS

2.8.1 OBJECTIVE

The objectives of the autorotational entries were to quantitatively investigate the attitude changes and the control inputs required to stabilize the helicopter in the event of a sudden loss in engine power.

2.8.2 METHOD

The autorotational entries were performed by first stabilizing the aircraft for a given trim condition and then rapidly reducing power to enter autorotation. The collective pitch control trim position was maintained for at least 2 seconds after the simulated power reduction, at which time the collective control was lowered. All other flight controls were held in the trim position until the helicopter was in stabilized autorotation or until corrective action was necessary. Control positions, aircraft attitudes and rates were recorded for each autorotation entry. The tests were conducted at an airspeed of 15 KCAS to 97 KCAS for the conditions specified in Section 2.0, "Introduction."

2.8.3 RESULTS

Time histories are presented in Figures No. 241 through 243, Section 3, Appendix I.

2.8.4 ANALYSIS

2.8.4.1 Quantitative Engineering Analysis of Autorotational Characteristics

a. Clean Configuration

A sudden reduction in power did not cause any adverse pitching or rolling moments and the autorotational entry characteristics

generally comply with the requirements of MIL-H-8501A, paragraph 3.5.5.1. There was sufficient rotor inertia to allow the collective control to be held in the trim position for at least 2 seconds after the power reduction, without causing the rotor speed to decrease to a value below the minimum rpm power off.

Following the power reduction the predominant motion of the aircraft was to yaw left immediately; however, this trim change was mild and easily controllable. The highest autorotational entry airspeed investigated was 97 KCAS. Autorotational entry characteristics were not affected by variations in altitude or gross weight.

The rotor speed decay rate was nonlinear with a high decay rate at the initial power loss and a decreasing decay rate as rotor speed decreased. The rotor speed decay rate was found to be primarily a function of collective control position with the highest decay rates being at high power and high collective pitch conditions such as hover, climb, maximum airspeeds, and heavy gross weight. Rotor speed buildup and the collective control of the rotor speed were satisfactory under all conditions tested.

b. Armed Configurations

Test results for the armed configurations showed that the autorotational entry characteristics were basically the same as those for the clean configuration.

2.8.5 QUALITATIVE PILOT'S COMMENTS ON AUTOROTATIONAL CHARACTERISTICS

a. Clean Configuration

Autorotation entry characteristics were very good. Autorotation entries were performed at airspeeds from 15 KCAS to Vmax at 5000 and 10,000 feet density altitude and at both forward and aft C.G. loadings. With a sudden reduction in power, there was an immediate yaw to the left which was easily controlled. No pitching, rolling or other adverse characteristics were noted. There was sufficient rotor inertia present to allow the collective pitch control to be held in the trim position for 2 seconds after the power reduction. With the collective fixed, rotor speed decayed rapidly but the rate of decay slowed after 1 or 2 seconds. The rotor speed stabilized at approximately 75 percent; however, the value of the stabilized rotor speed was influenced by some residual power from the engine. When the collective pitch was lowered rapidly, there was a slight pitch up. With the collective pitch down, rotor speed increased rapidly and a rotor overspeed would result if the collective pitch was left in the full down position.

b. Armed Configuration

No adverse characteristics were noted in the armed configuration and the reaction to a sudden power loss was basically the same as for the clean configuration.

2.9 FLIGHT CONTROL SYSTEM EVALUATION

2.9.1 OBJECTIVE

The objective of these tests was to quantitatively evaluate the flight control system for force gradients, static and dynamic friction. The control systems were also evaluated to determine compliance with MIL-H-8501A with the hydraulic boost system both "on" and "off."

2.9.2 METHOD

The control system "breakout" forces and force gradients were evaluated by recording the force required for a control movement with the frictional control varied from the full "on" to the full "off" position (where applicable). The tests were conducted with the helicopter on the ground with the rotor static and hydraulic pressure being applied to the control system by an external source. Qualitative tests were also conducted on the control systems during the stability and control tests.

2.9.3 RESULTS

Test results are presented graphically and summarized in Figures No. 244 through 247, Section 3, Appendix I.

2.9.4 ANALYSIS

2.9.4.1 Quantitative Engineering Analysis of Flight Control System

a. Longitudinal Control Forces

The longitudinal breakout forces with the boost system operative were found to be above the maximum allowed in MIL-H-8501A, paragraph 3.2.7. The breakout force varied approximately 1 pound as the adjustable friction control was varied from the full "on" to the full "off" position.

The longitudinal force gradient was found to be slightly negative when the cyclic stick was traveling from a full forward to full aft position. The longitudinal force gradient was positive when moving the cyclic stick from aft to forward. This stick force reversal was contrary to the requirements of MIL-H-8501A, paragraph 3.2.4.

b. Lateral Control Forces

When the boost system was operative the lateral breakout forces were larger than the maximum allowed in MIL-H-8501A, paragraph 3.2.7. The change in breakout forces with the control friction setting was found to be approximately 1 pound between the full "on" and full "off" position.

The lateral force gradient was found to be slightly negative when the cyclic stick was displaced in either direction. This negative force gradient was in violation of MIL-H-8501A, paragraph 3.2.4.

c. Directional Control Forces

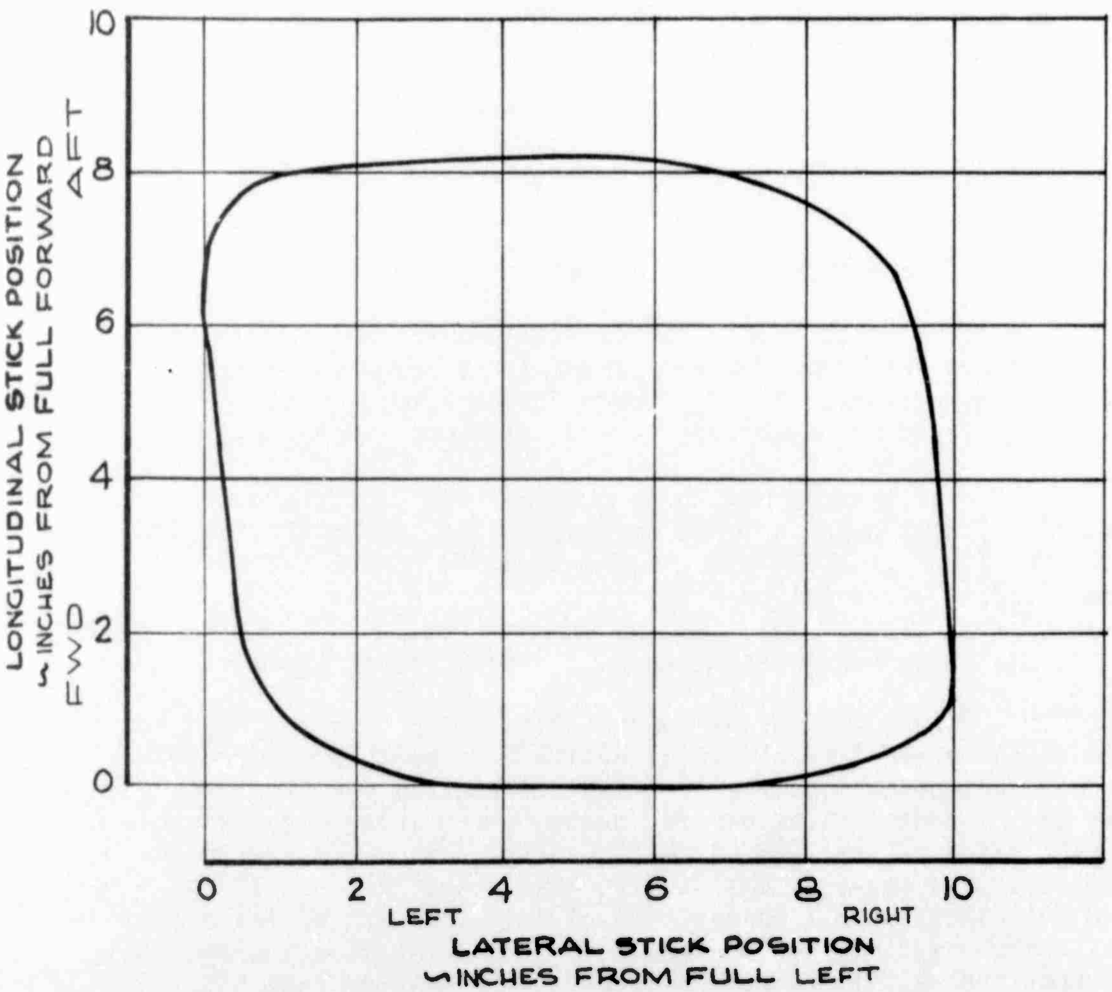
The directional control breakout forces with boost system operative were found in most cases to be below those required in MIL-H-8501A, paragraph 3.2.7. These forces were inadequate and should be increased to comply with the requirements of MIL-H-8501A.

The directional force gradient was positive over the entire pedal travel range. There were no objectionable discontinuities in the force gradient and the requirements of MIL-H-8501A, paragraph 3.2.4, are complied with.

d. Longitudinal and Lateral Control Travel Limits

The longitudinal control travel limits were found to be a function of the lateral cyclic position. The lateral control limits were dependent upon the longitudinal control position. These changes in the control limits were caused by the irregular shape of the cyclic stick pattern, which consequently caused a change in the available control travel. The data in this report were based on maximum full longitudinal control travel (8.2 inches) and maximum lateral control travel (9.5 inches). The following figure graphically illustrates the cyclic control pattern. (See Figure II, Page 52).

FIG. H
CYCLIC PITCH CONTROL PATTERN
· OH-4A ·



2.9.5 QUALITATIVE PILOT'S COMMENTS ON FLIGHT CONTROL SYSTEM

The breakout forces were less than 2 pounds for all the controls. These forces were low enough to give a good feel and yet high enough to hold the controls in any position they were placed. The magnitude of the breakout forces appeared to be the same throughout the full range of control travel.

There were no apparent force gradients present in the control system. The moving friction was the same as the static breakout friction and the control could be moved through the full travel by applying approximately 2 pounds of force.

Since there were no forces to oppose a control movement from trim, there was no trim system present, nor was there a requirement for one. The controls would remain in the position in which they were placed and hands off flight could be accomplished, so far as the control system was concerned. Removing the copilot controls unbalanced the system and with no friction applied at airspeeds above 85 KCAS, the pilot's control would move aft when released. This was easily corrected by a slight increase in the friction setting.

There was a mechanical longitudinal-collective coupling present with the boost system both operative and inoperative. The longitudinal control moved forward as the collective control was raised and moved aft as the collective was lowered. Movement of the cyclic did not cause any collective movement with the boost "on"; however, with the boost "off" cyclic movement caused the collective control to move. The longitudinal control travel available was not affected by this control coupling. Although in violation of MIL-H-8501A, paragraphs 3.2.4 and 3.4.3, this small coupling was very easily overcome by the pilot, either by holding the control or by using a small amount of friction.

The seat was not adjustable; however, the longitudinal cyclic and the pedals could be manually adjusted. The range of adjustment was sufficient for the project pilot and the controls were comfortable throughout the control pattern. The longitudinal cyclic friction adjustment was difficult to reach in flight, while wearing a parachute.

The directional control system did not meet the requirements of MIL-H-8501A, Table II, in that the pedal breakout forces were less than 3 pounds and there was no friction on the directional controls. There was some "slop" in the directional control around the neutral point. This condition, coupled with the low breakout forces and high directional sensitivity, made the present control system undesirable.

Turning the single boost system "off" did not introduce any control movement or forces. Increased control forces were apparent only when the controls were moved. The forces were not measured in flight; however, they were considered satisfactory. Boost "off," the pedal forces were highest and the lateral cyclic forces were lowest. The helicopter could be adequately maneuvered and a landing could be accomplished satisfactorily with the control boost "off."

2.10 AIRSPEED CALIBRATION

2.10.1 OBJECTIVE

The objective of the tests was to determine the airspeed position error for both the standard and test airspeed systems.

2.10.2 METHOD

The airspeed calibration of the test and standard system was determined by using the ground speed course method. The aircraft was flown over a measured ground course at a stabilized airspeed on reciprocal headings from 20 KIAS to 110 KIAS using approximately 10 knot airspeed increments. The tests were conducted at a density altitude of 1950 feet, a gross weight of 2475 pounds, 393 rotor rpm (average) and in the clean configuration.

2.10.3 RESULTS

Test results are presented graphically in Figures No. 248 through 24[illegible] Section 3, Appendix I.

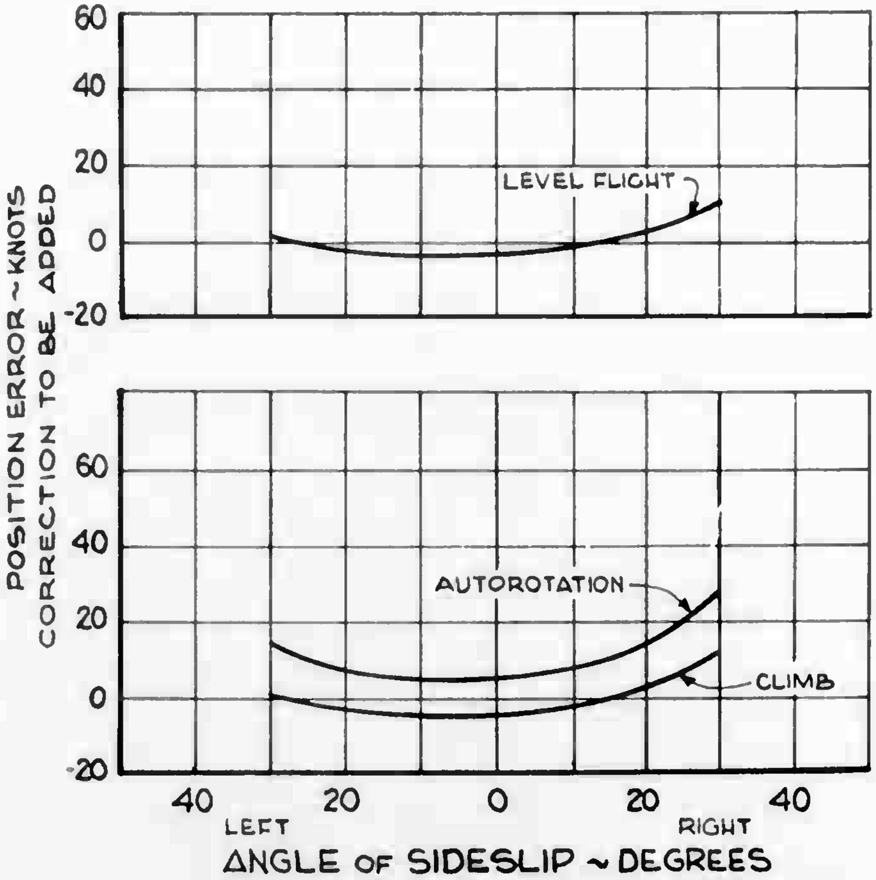
2.10.4 ANALYSIS

The standard system indicated low for all airspeeds above 35 knots and high for all airspeeds below 35 knots. The position error curve was nonlinear with an increased negative position error with increased airspeed. The position error appeared to be greater as the sideslip angle was increased during climb, level flight and autorotation. At low airspeeds (below 50 KCAS) and large sideslip angles (above 30 degrees), the standard system appeared to become unreliable. (See Figure I, Page 55).

FIG. I

AIRSPEED CALIBRATION IN SIDESLIP

FLIGHT CONDITION	CAS ~KTS	AVG. H_p ~FT	AVG. G.W. ~LB.	ROTOR RPM
LEVEL FLT.	35	4760	2590	344
CLIMB	45	5000	2920	394
AUTOROTATION	45	5000	2920	394



(THIS PAGE INTENTIONALLY LEFT BLANK)

SECTION 3 - APPENDICES

APPENDIX I - TEST DATA

(This page intentionally left blank)

FIGURE NO. 1

SUMMARY OF CONTROL POSITIONS IN FORWARD FLIGHT

OH-4A USA S/N 62-4204

SYM	AVG H_P ~ FT	AVG G.W. ~ LB	AVG CG ~ IN. LONG	AVG CG ~ IN. LAT	ROTOR RPM	CONFIGURATION	FLT. COND.
○	5000	2570	105.00 (AFT)	.35 RT	394	CLEAN	LEVEL FLT.
□	10000	2570	105.00 (AFT)	.35 RT	394	CLEAN	LEVEL FLT.
△	5000	2900	105.00 (AFT)	.75 RT	394	CLEAN	LEVEL FLT.
△	5000	2570	100.00 (FWD)	.35 RT	394	CLEAN	LEVEL FLT
△	5000	2570	104.70 (AFT)	1.25 LT	394	XM-7	LEVEL FLT
◇	5000	2570	105.00 (AFT)	1.30 LT	394	XM-8	LEVEL FLT.

POINTS DERIVED FROM FIGURE NO. 2 THROUGH 7

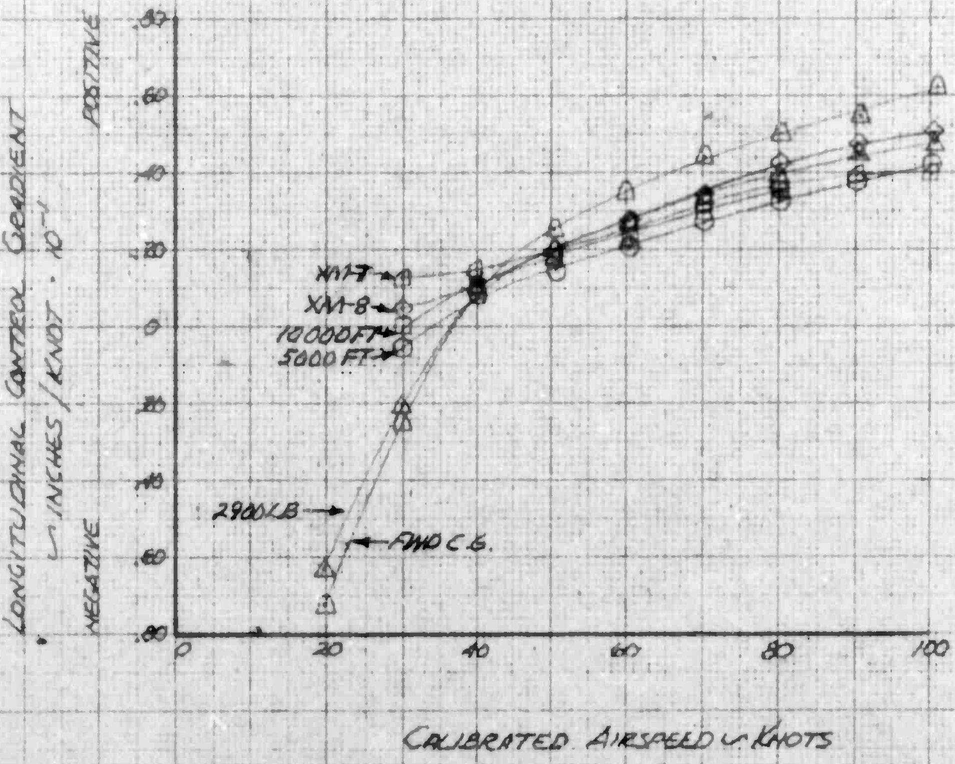


FIGURE No. 2
CONTROL POSITIONS IN FORWARD FLIGHT
OH-4A USA S/N 62-4204

SYM	AVG Hp ~ FT	AVG G.W. ~ LB	AVG C.G ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND.
○	5000	2615	105.80	.35 RT	394	CLEAN	LEVEL FLIGHT
□	5000	2535	105.45	.35 RT	394	CLEAN	CLIMB
△	5000	2515	105.30 (AFT)	.35 RT	394	CLEAN	AUTOROTATION

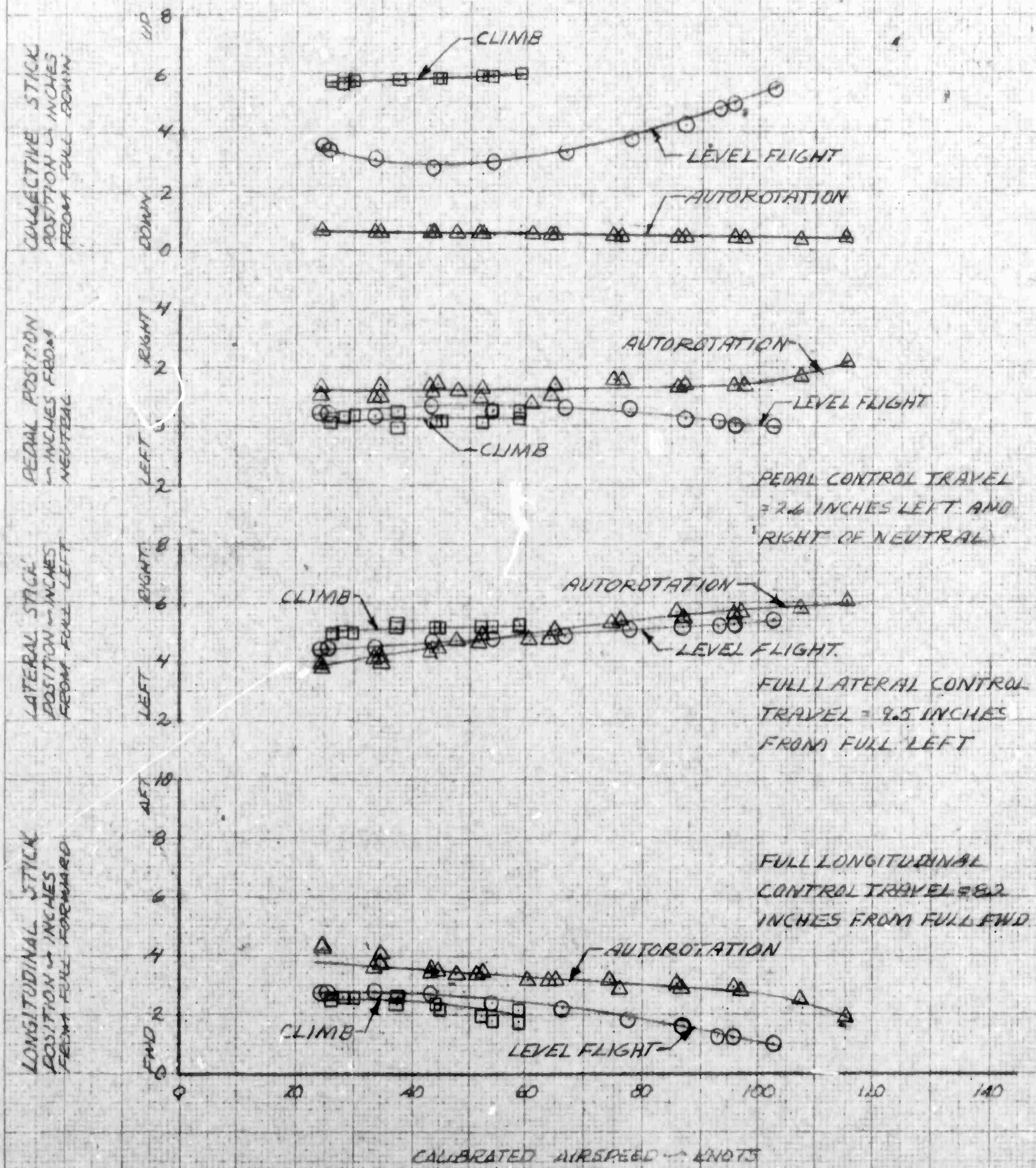


FIGURE No. 3

CONTROL POSITIONS IN FORWARD FLIGHT

OH-4A USA S/N 62-4204

SYM	AVG H_P ~FT	AVG G.W. ~LB	AVG C.G. ~IN LONG	AVG C.G. ~IN LAT	ROTOR RPM	CONFIGURATION	FLT. COND.
○	5840	2530	99.95	.36 RT	393	CLEAN	LEVEL FLIGHT
□	5000	2620	100.60	.36 RT	394	CLEAN	CLIMB
△	5000	2600	100.45 (FWD)	.35 RT	391	CLEAN	AUTOROTATION

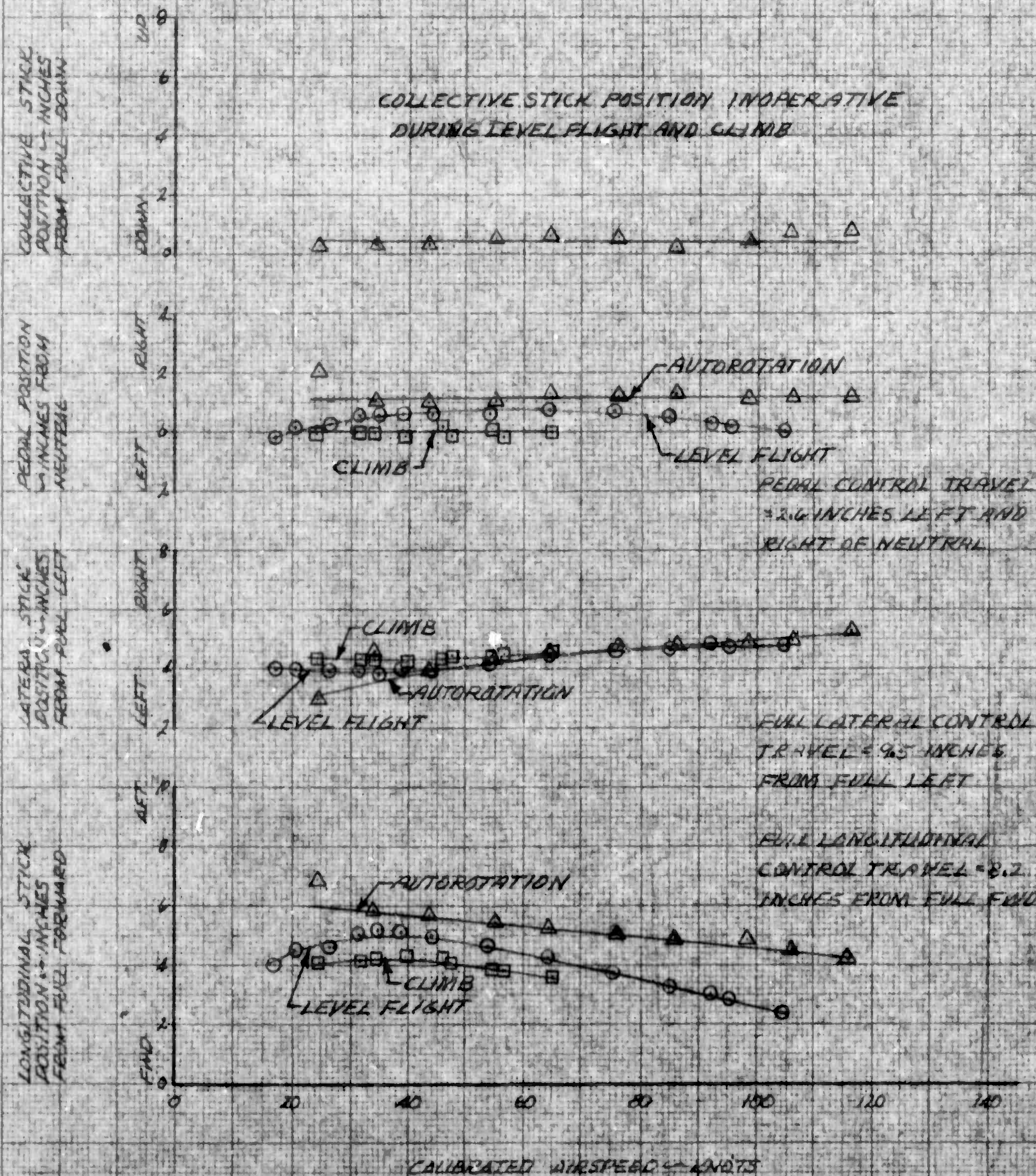


FIGURE NO. 4

CONTROL POSITIONS IN FORWARD FLIGHT

OH-4A USA S/N 62-4204

SYM	AVG H_p ~ FT	AVG G.W. ~ LB	AVG C.G. ~ IN LONG	AVG C.G. ~ IN LAT	ROTOR RPM	CONFIGURATION	F.T. COND.
○	4930	2905	105.10	.75 LT	394	CLEAN	LEVEL FLIGHT
□	5000	2930	105.20	.75 LT	394	CLEAN	CLIMB
△	5000	2915	105.10 (AFT)	.75 LT	399	CLEAN	AUTOROTATION

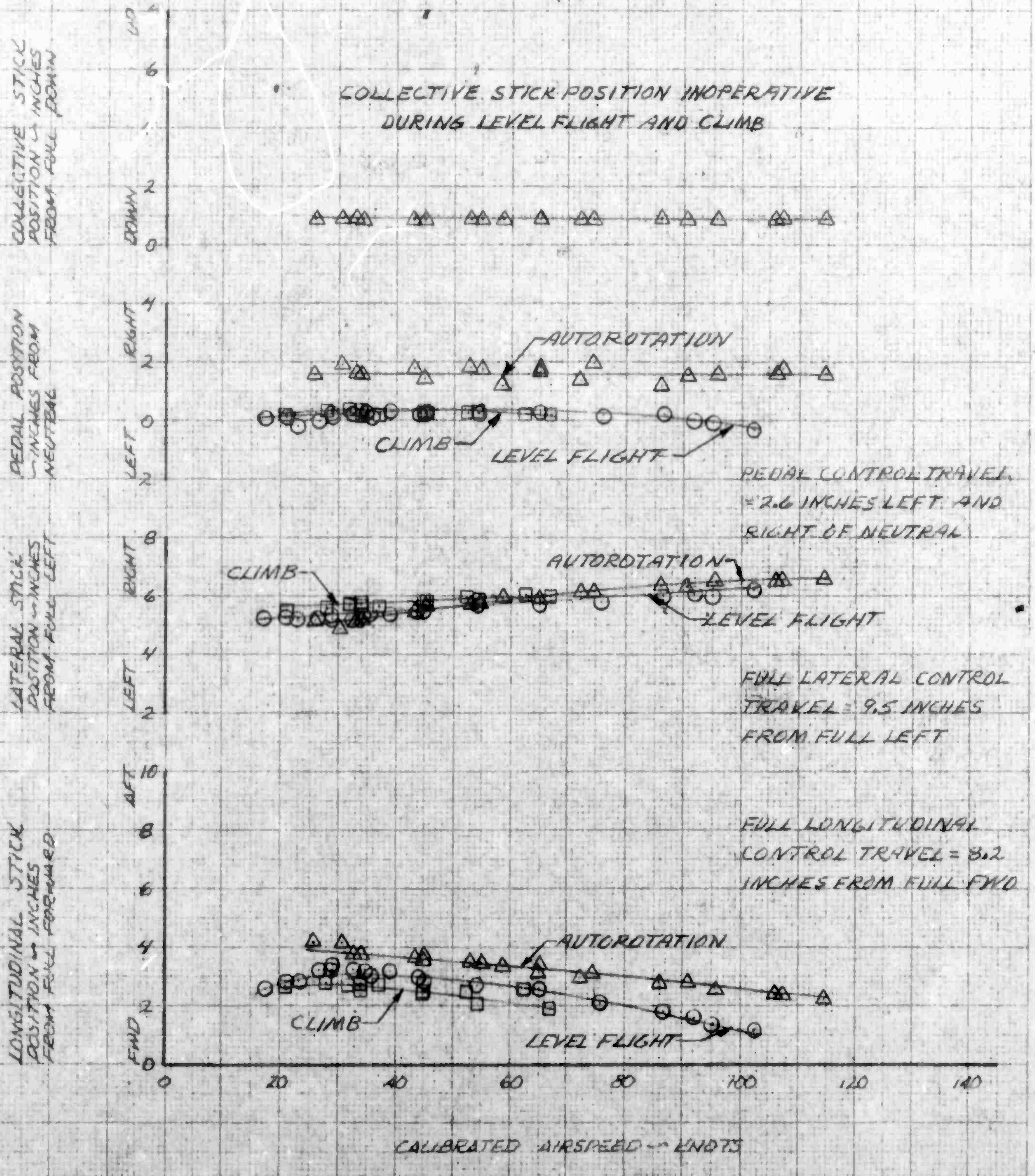
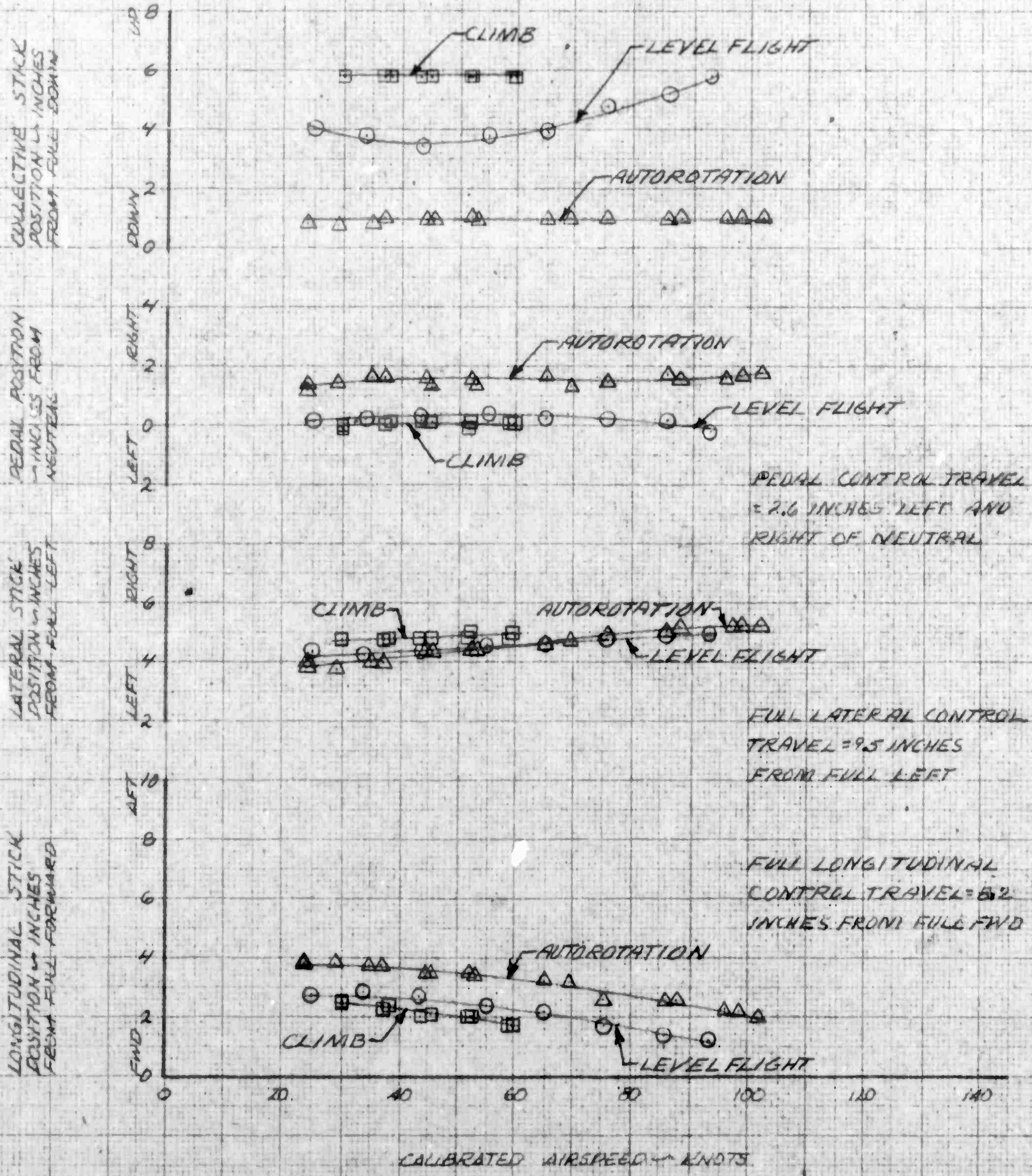


FIGURE NO. 5
CONTROL POSITIONS IN FORWARD FLIGHT
OH-4A USA S/N 62-4204

SYM	AVG H_D ~FT	AVG G.W ~LB	AVG C.G ~IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND.
○	10000	2535	105.40	.35RT	394	CLEAN	LEVEL FLIGHT
□	10000	2495	105.20	.35RT	394	CLEAN	CLIMB
△	10000	2550	105.50 (AFT)	.35RT	394	CLEAN	AUTOROTATION



FOR OFFICAL USE ONLY

FIGURE NO. 6
CONTROL POSITIONS IN FORWARD FLIGHT
OH-4A USA S/N 62-4204

SYM	AVG H_p ~ FT	AVG G.W ~ LB	AVG C.G ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND.
○	5000	2640	105.00	1.25 LT	394	XM-7	LEVEL FLIGHT
□	5000	2580	104.70	1.25 LT	394	XM-7	CLIMB
△	5000	2565	104.60 (AFT)	1.25 LT	402	XM-7	AUTOROTATION

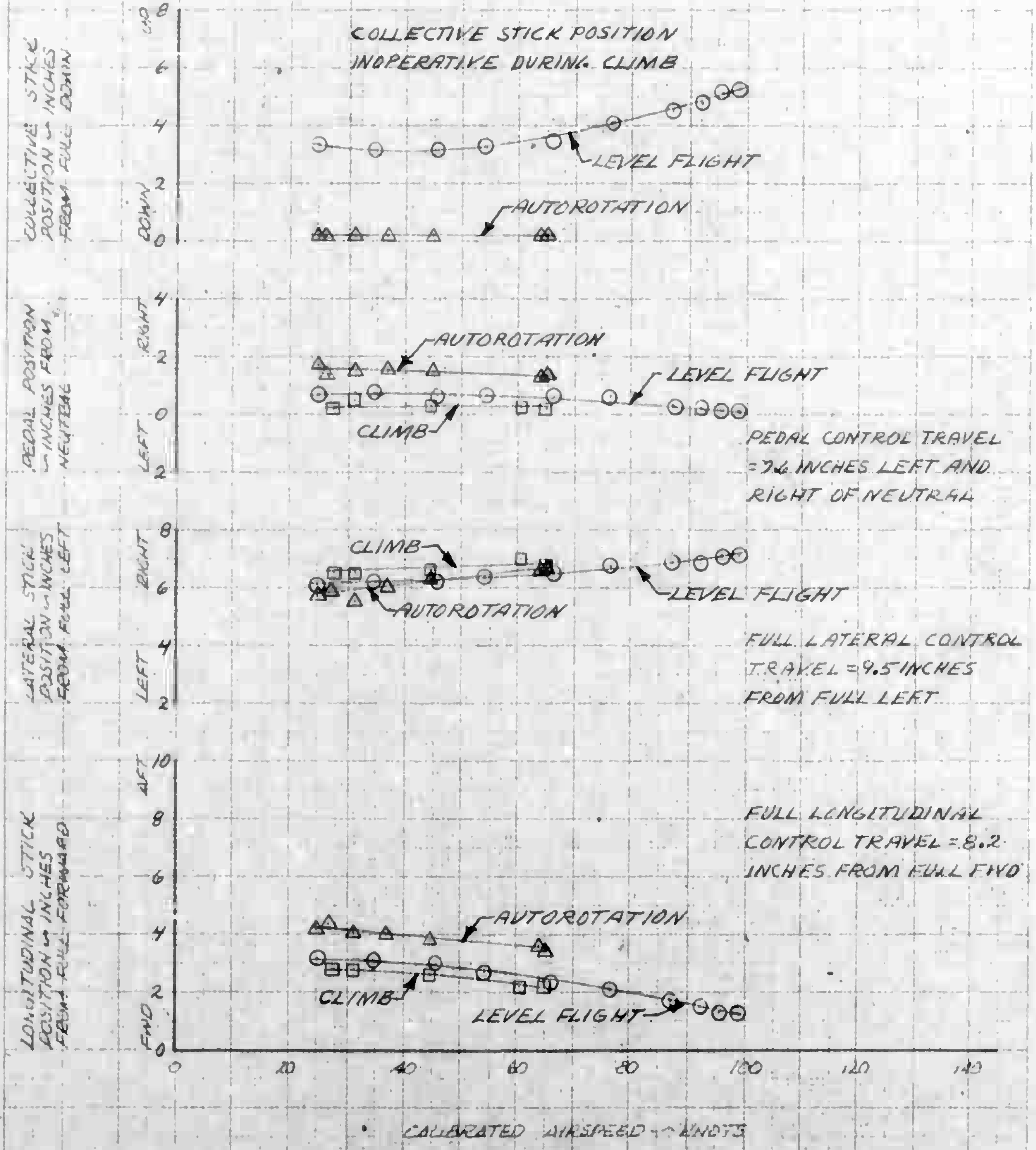


FIGURE NO. 7
CONTROL POSITIONS IN FORWARD FLIGHT
OH-4A USA S/N 62-4204

SYM	AVG H_P ~ FT	AVG G.W. ~ LB	AVG C.G. ~ IN LONG	AVG C.G. ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT. COND.
○	5000	2610	105.00	1.30 LT	390	XM-8	LEVEL FLIGHT
□	5000	2610	105.00	1.30 LT	391	XM-8	CLIMB
△	5000	2600	104.95 (AFT)	1.30 LT	410	XM-8	AUTOROTATION

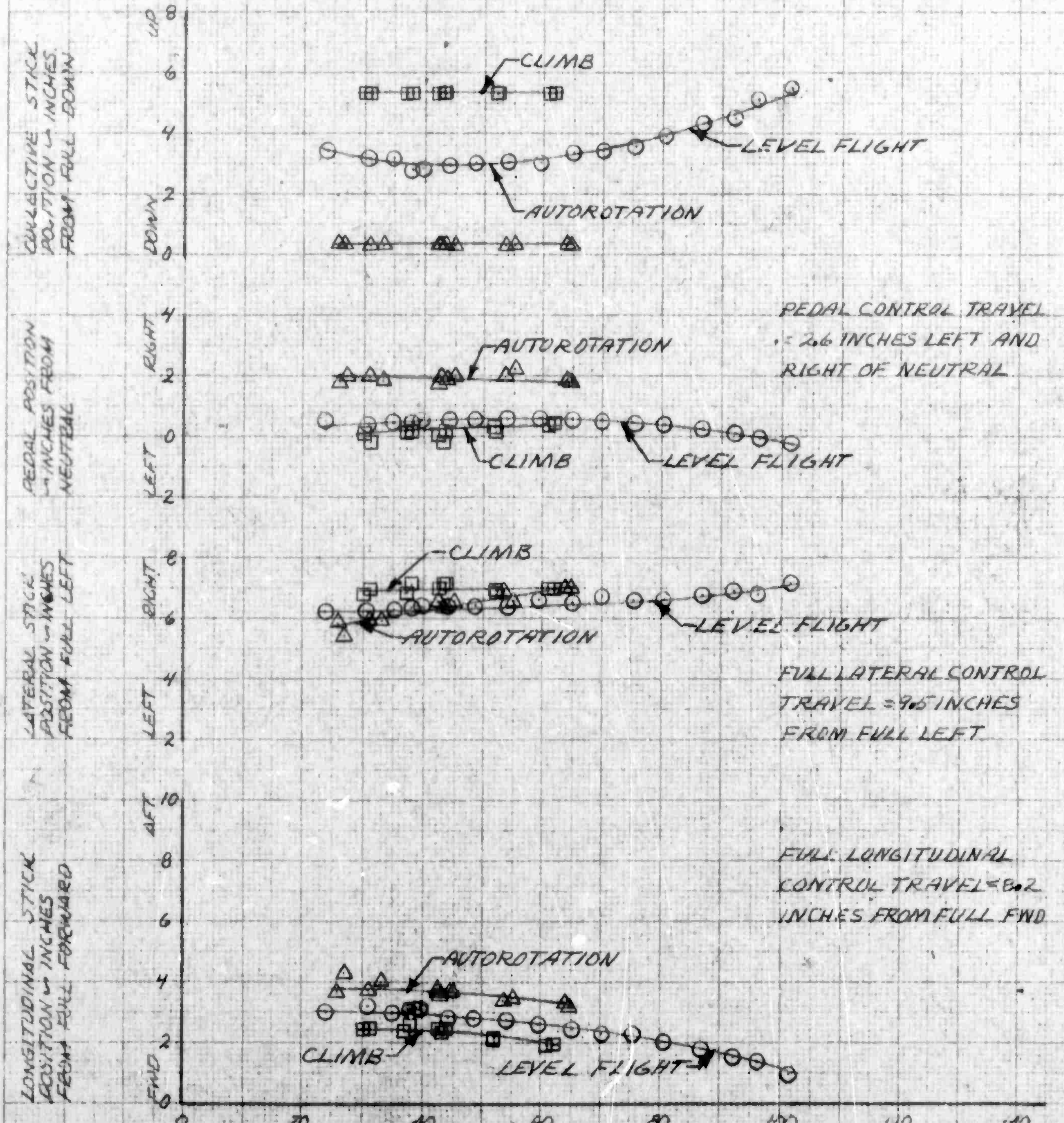
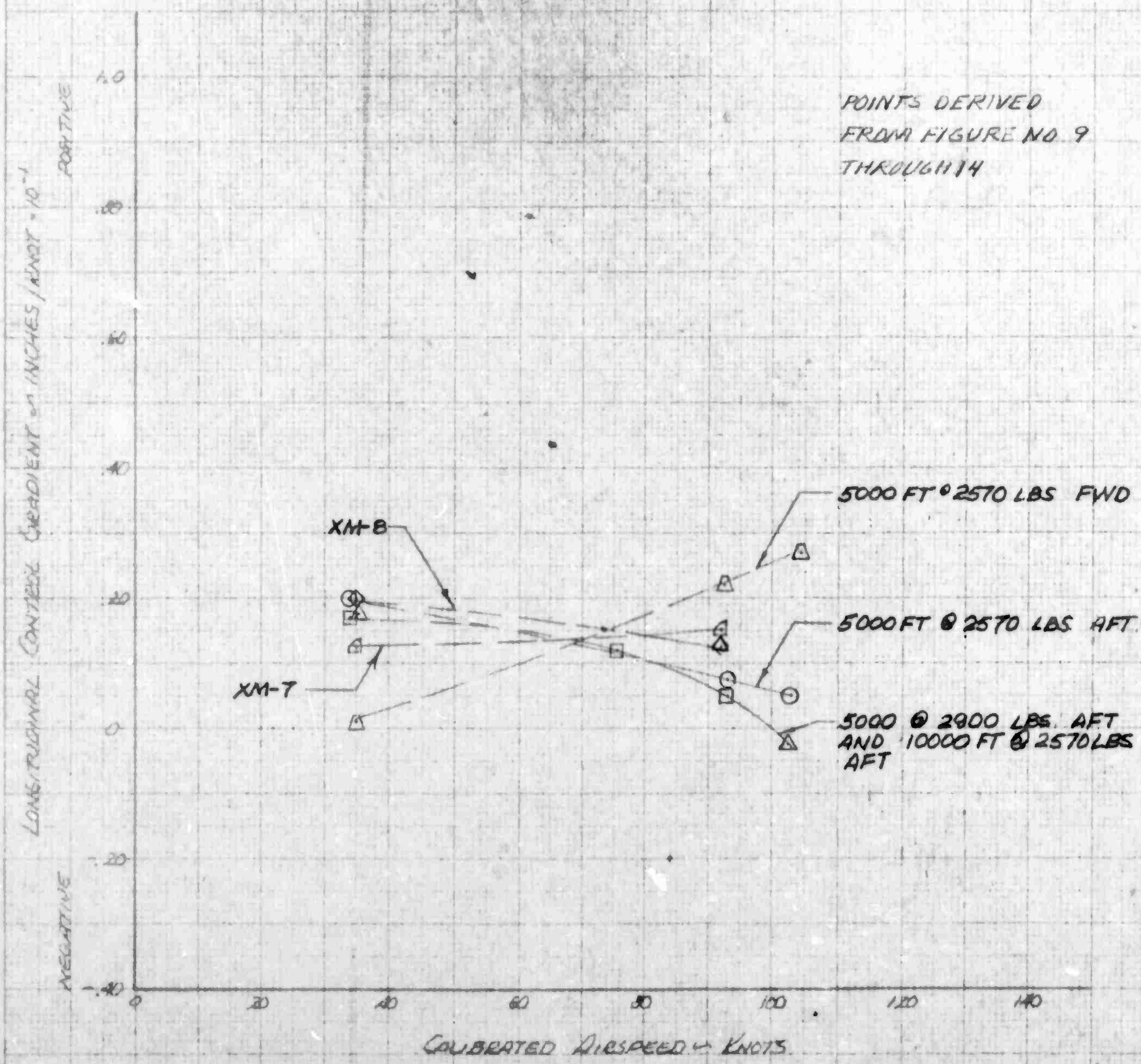


FIGURE NO. 8

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY SUMMARY

OH-4A USA S/N 62-4204

SYM	AVG Hp ~FT	AVG G.W. ~LB	AVG CG ~ IN LONG.	LAT.	ROTOR RPM	CONFIGURATION	FLT. COND.
○	5000	2570	105.0(AFT)	.35 RT	394	CLEAN	LEVEL FLIGHT
□	10000	2570	105.0(AFT)	.35 RT	394	CLEAN	LEVEL FLIGHT
△	5000	2900	105.0(AFT)	.75 LT	394	CLEAN	LEVEL FLIGHT
△	5000	2570	100.0(FWD)	.35 RT	394	CLEAN	LEVEL FLIGHT
◇	5000	2570	104.7(AFT)	1.25 LT	394	XM-7	LEVEL FLIGHT
◇	5000	2570	105.0(AFT)	1.30 LT	394	XM-8	LEVEL FLIGHT



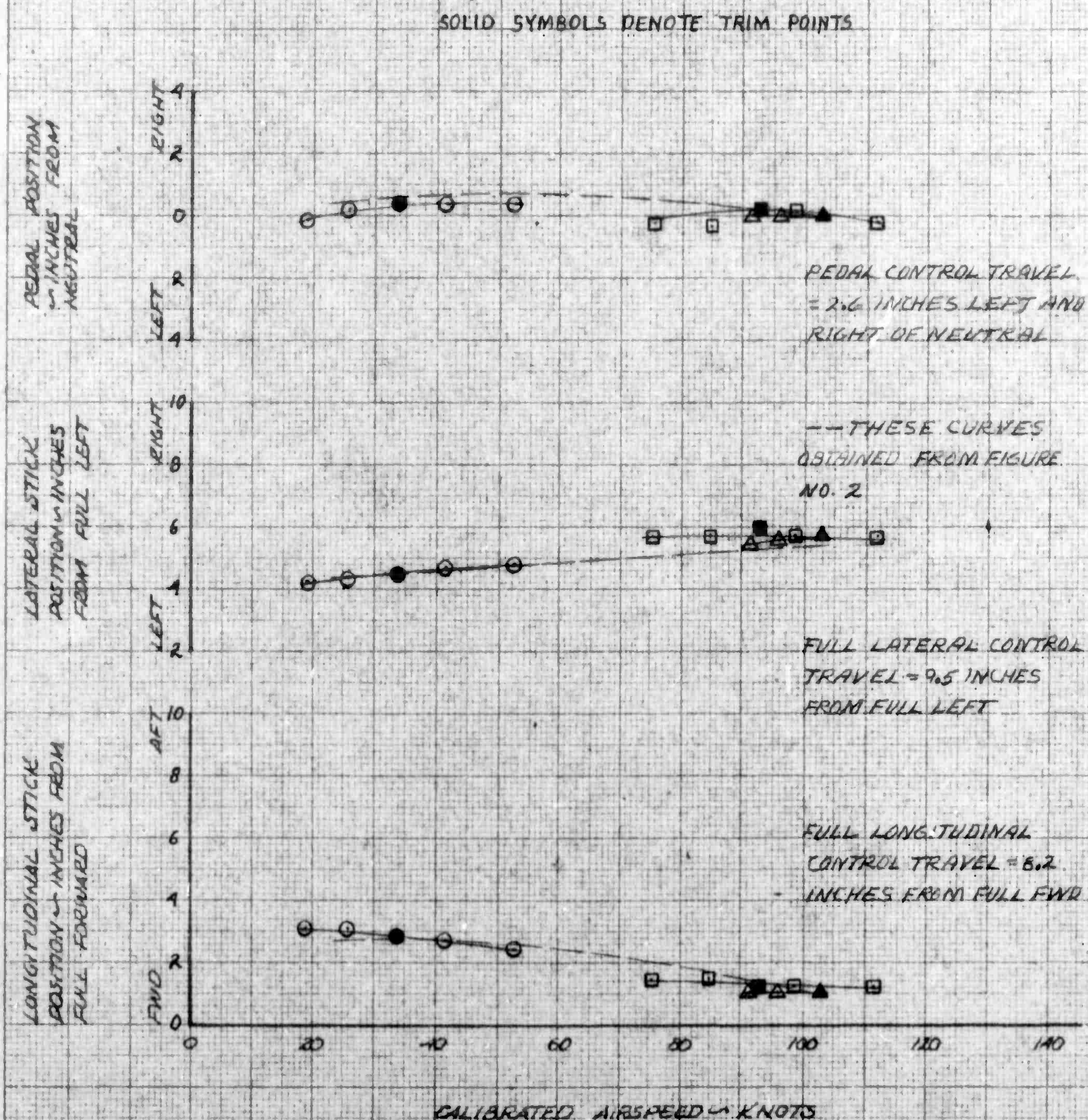
FOR OFFICAL USE ONLY

FIGURE NO. 4

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

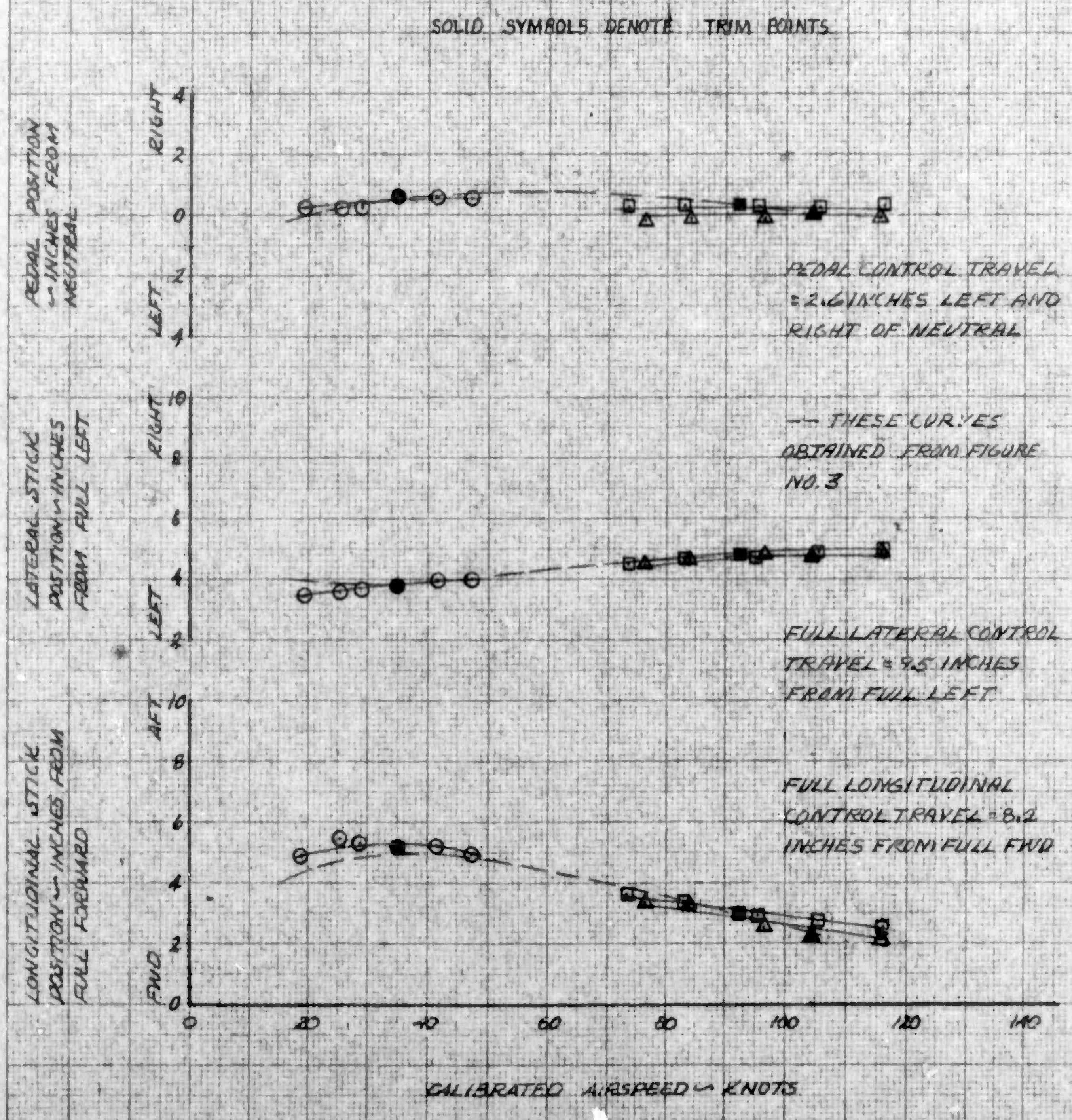
OH-4A USA S/N 62-4204

SYM	AVG H_D ~FT	AVG G.W. ~LB	AVG CG ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND.
○	5000	2635	105.90	.35 RT.	394	CLEAN	LEVEL FLIGHT
□	5000	2600	105.70	.35 RT.	394	CLEAN	LEVEL FLIGHT
△	5000	2580	105.60 (AFT)	.35 RT.	394	CLEAN	LEVEL FLIGHT



STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY
OH-4A USA S/N 62-4204

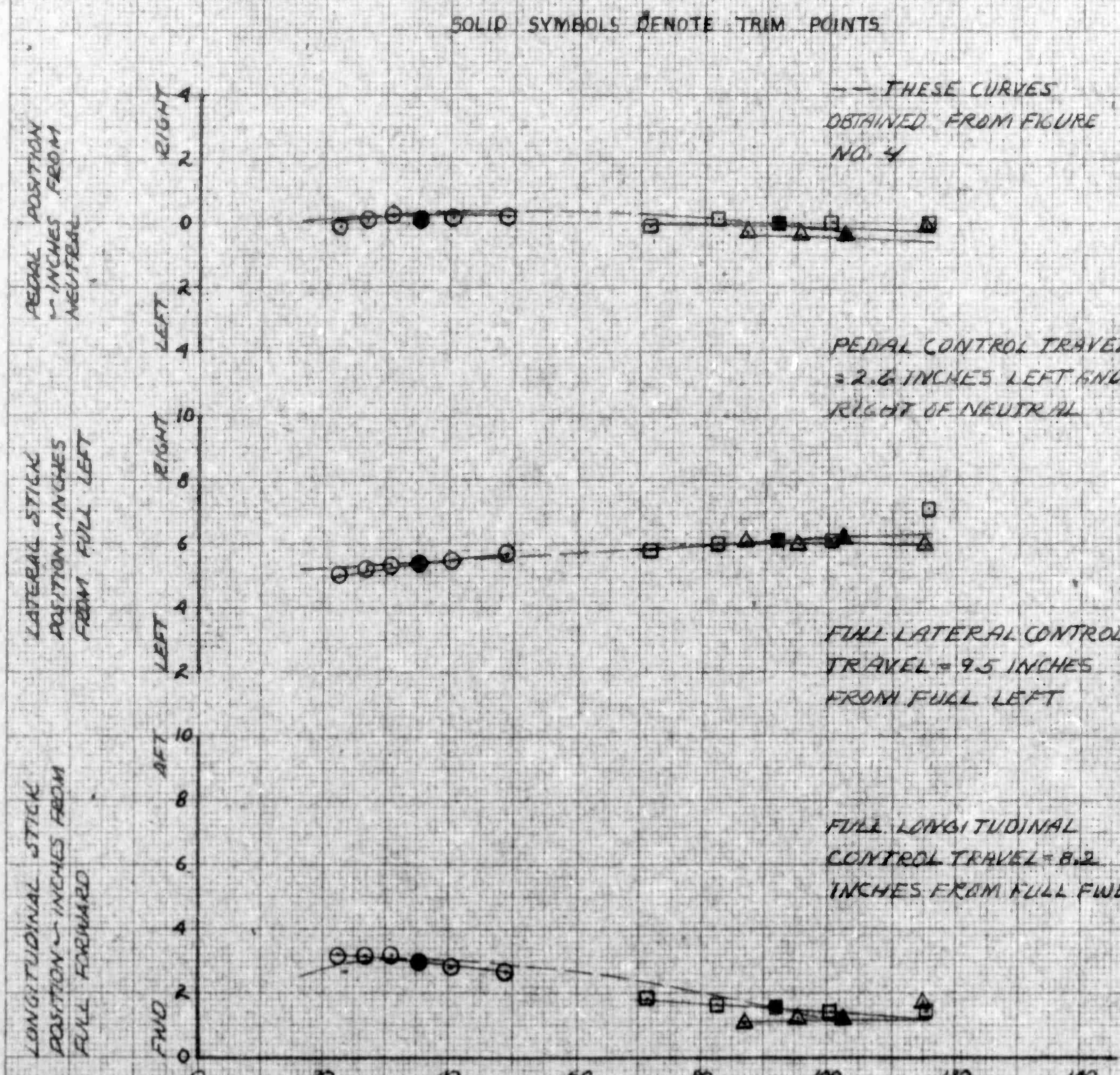
SYM	AVG H_D ~FT	AVG G.W. ~LB	AVG CG ~ IN LONG	AVG CG ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT COND.
○	5000	2600	100.50	.35 RT.	394	CLEAN	LEVEL FLIGHT
□	5000	2590	100.40	.35 RT.	394	CLEAN	LEVEL FLIGHT
△	5000	2505	99.80 (FWD)	.35 RT.	392	CLEAN	LEVEL FLIGHT



FOR OFFICAL USE ONLY

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY
OH-4A USA S/N 62-4204

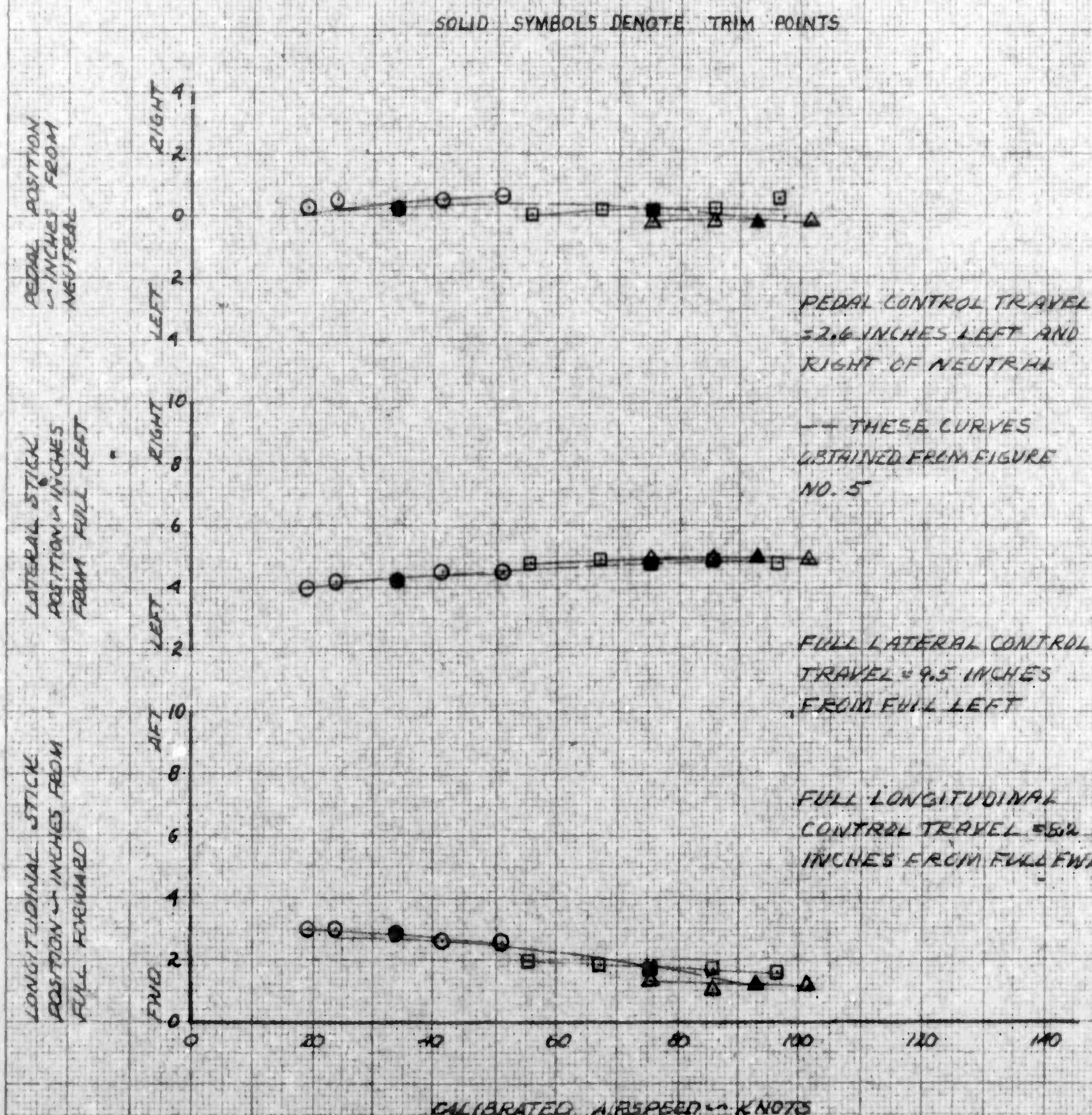
SYM	AVG H_D ~ FT.	AVG G.W. ~ LB	AVG CG ~ IN LONG	AVG CG ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT. COND.
○	5000	2930	105.20	.75 LT.	394	CLEAN	LEVEL FLIGHT
□	5000	2885	105.00	.75 LT.	394	CLEAN	LEVEL FLIGHT
△	5000	2865	104.90 (AFT)	.75 LT.	394	CLEAN	LEVEL FLIGHT



FOR OFFICAL USE ONLY

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY
OH-4A USA S/N 62-4204

SYM	AVG H_p ~FT	AVG G.W. ~LB	AVG CG ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND.
○	10000	2545	105.40	.35 RT.	394	CLEAN	LEVEL FLIGHT
□	10000	2530	105.40	.35 RT.	394	CLEAN	LEVEL FLIGHT
△	10000	2520	105.30 (AFT)	.35 RT.	394	CLEAN	LEVEL FLIGHT

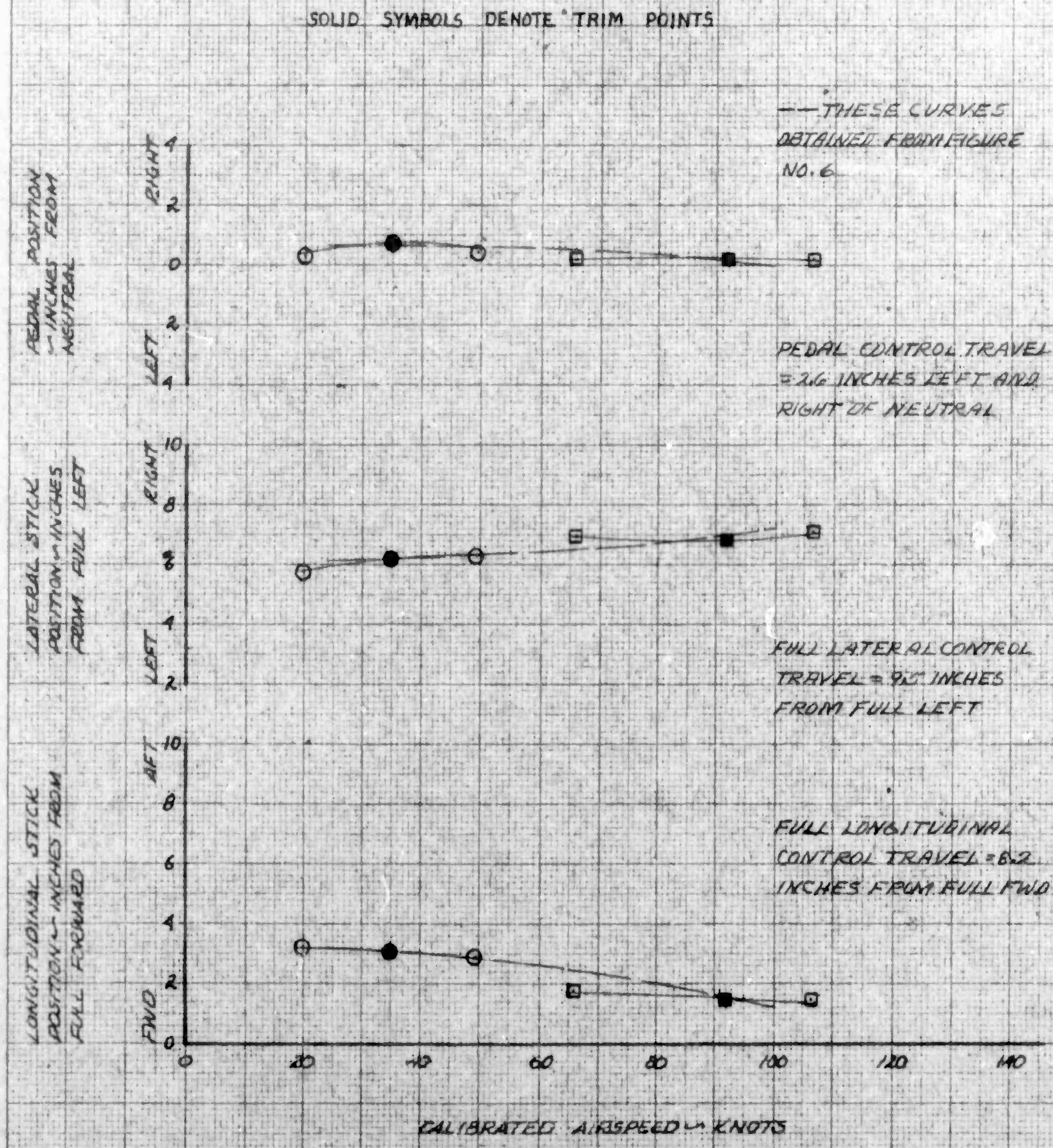


FOR OFFICAL USE ONLY

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

OH-4A USA S/N 62-4204

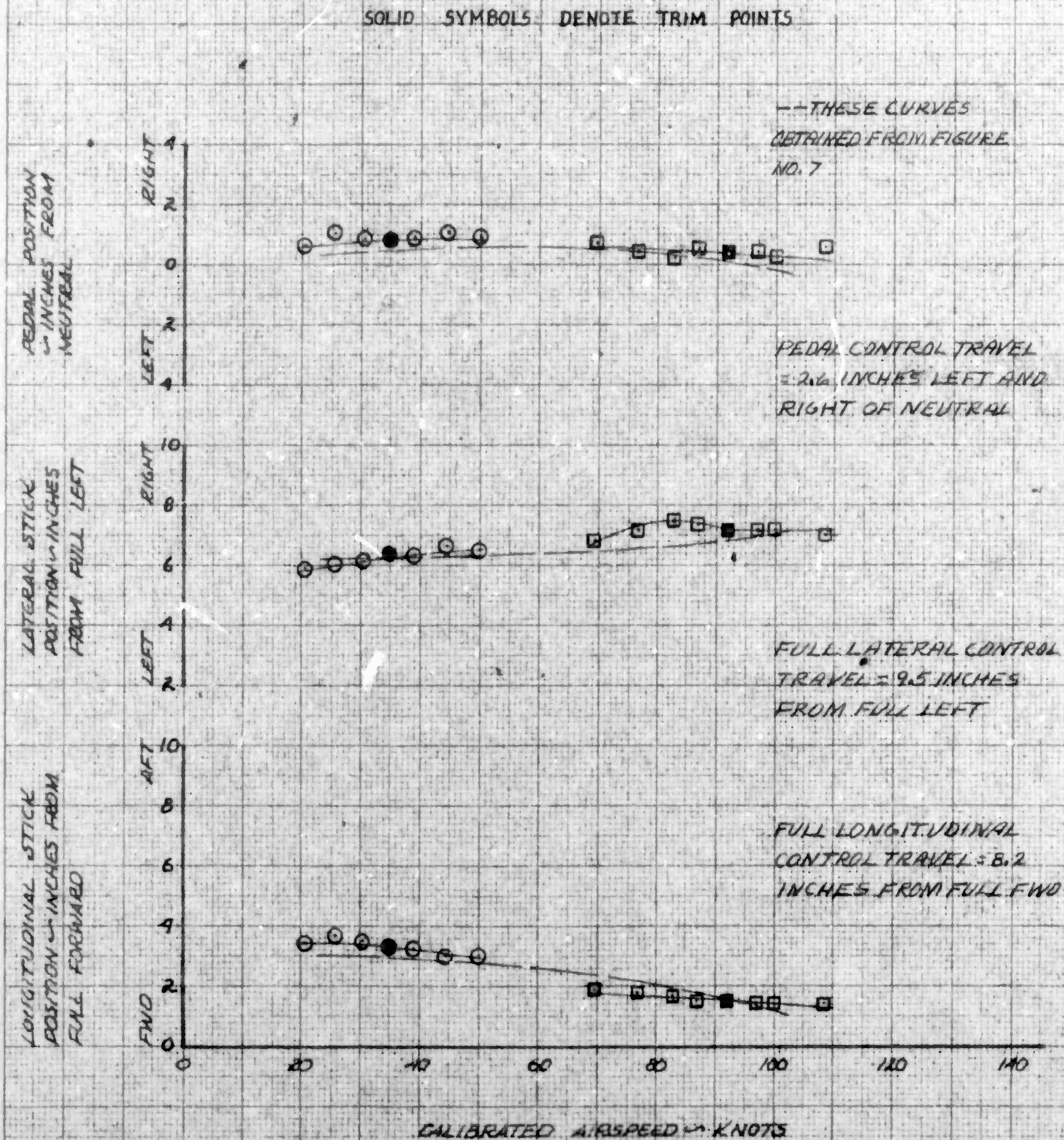
SYM	AVG H_P ~FT	AVG G.W. ~LB	AVG CG ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT. COND.
○	5000	2656	105.10	1.25 LT.	394	XM-7	LEVEL FLIGHT
□	5000	2635	105.00 (AFT)	1.25 LT.	394	XM-7	LEVEL FLIGHT



FOR OFFICAL USE ONLY

STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY
OH-4A USA S/N 62-4204

SYM	AVG H_p ~FT	AVG G.W. ~LB	AVG CG ~ IN LONG	AVG CG ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	5000	2555	104.70	1.30 LT	394	XM-8	LEVEL FLIGHT
□	"	2535	104.70 (AFT)	1.30 LT	394	XM-8	LEVEL FLIGHT

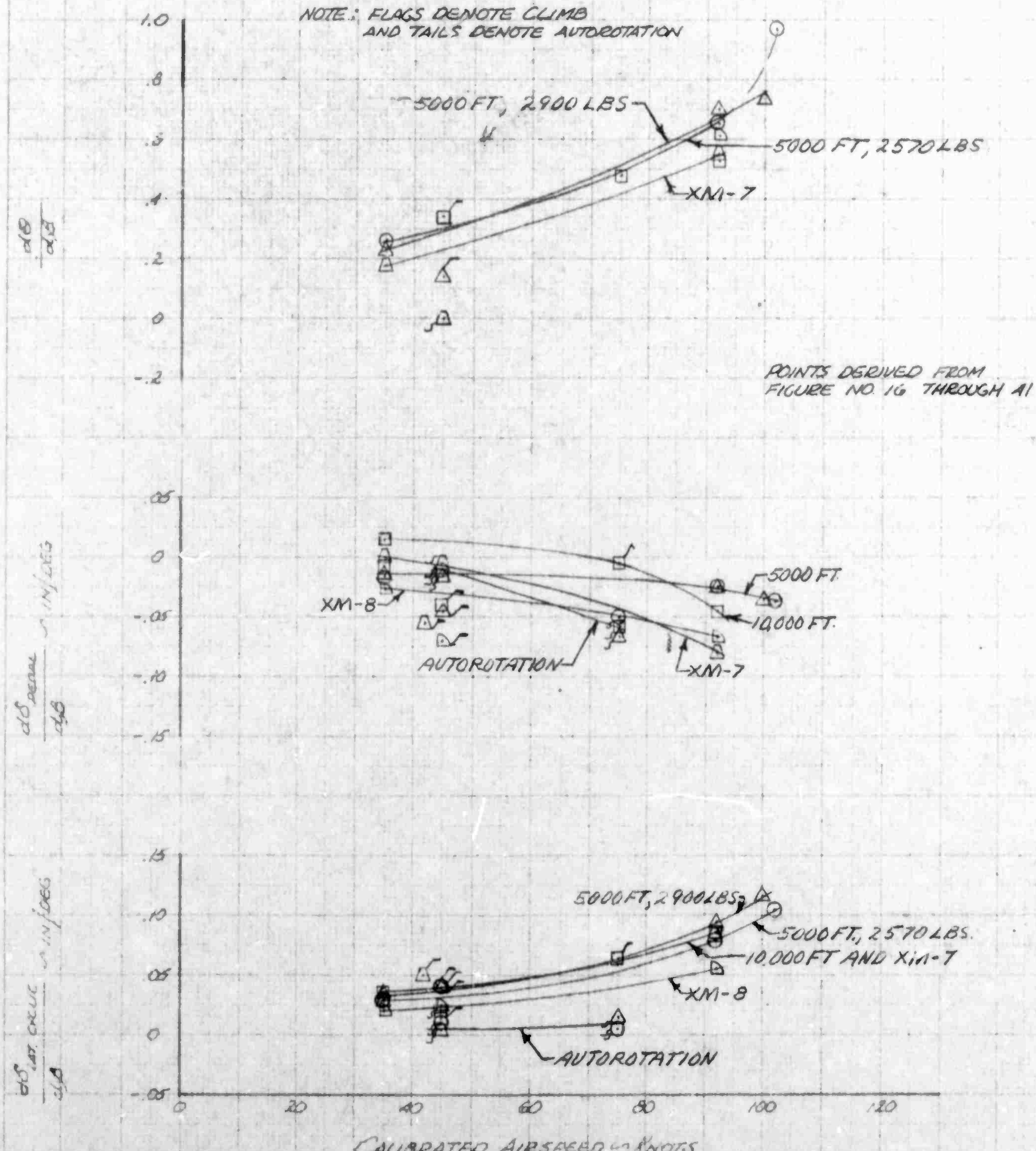


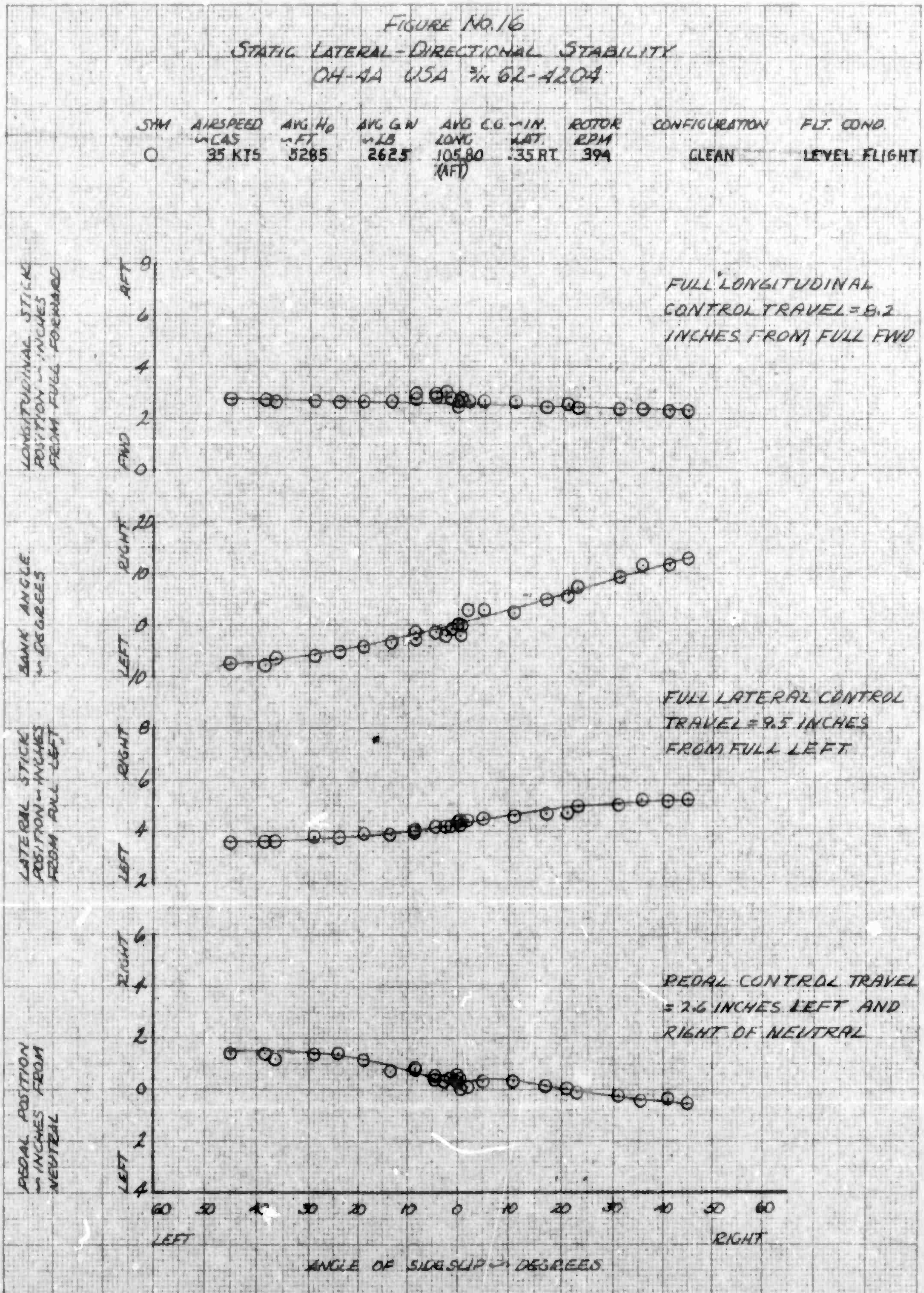
SUMMARY OF LATERAL-DIRECTIONAL STABILITY

OH-4A USA S/N 62-4204

ALL VALUES DETERMINED AT ZERO SIDESLIP

SYM	AVG H_p ~ FT	AVG G.W. ~ LB	AVG C.G. ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT. COND
○	5000	2570	105.0(AFT)	.35 RT	394	CLEAN	LEVEL FLIGHT
□	10000	2570	105.0(AFT)	.35 RT	394	CLEAN	LEVEL FLIGHT
△	5000	2900	105.0(AFT)	.75 LT.	394	CLEAN	LEVEL FLIGHT
Δ	5000	2570	104.7(AFT)	1.25 LT.	394	XM-7	LEVEL FLIGHT
▷	5000	2570	105.0(AFT)	1.30 LT.	394	XM-8	LEVEL FLIGHT





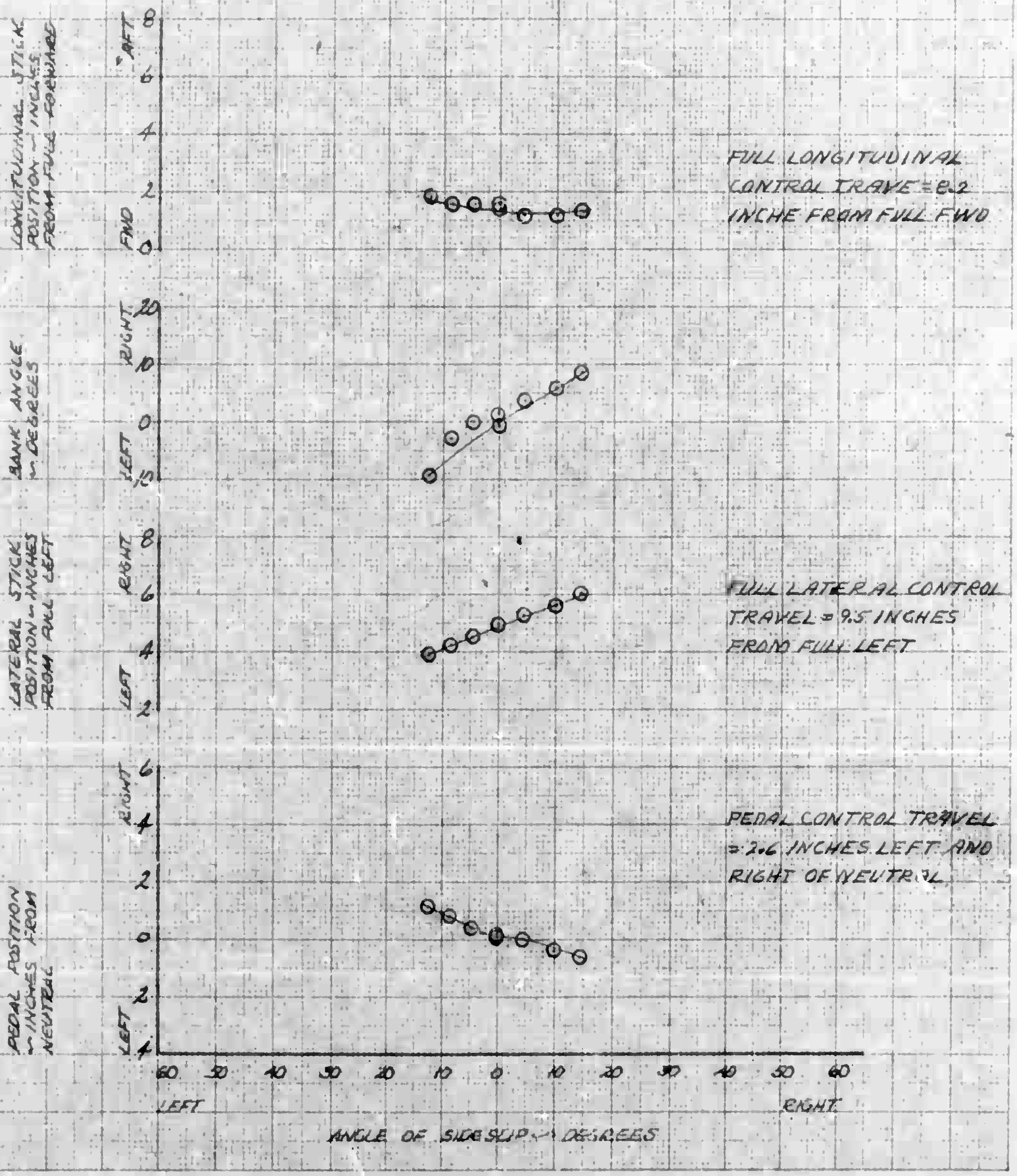
FOR OFFICAL USE ONLY

FIGURE NO. 17

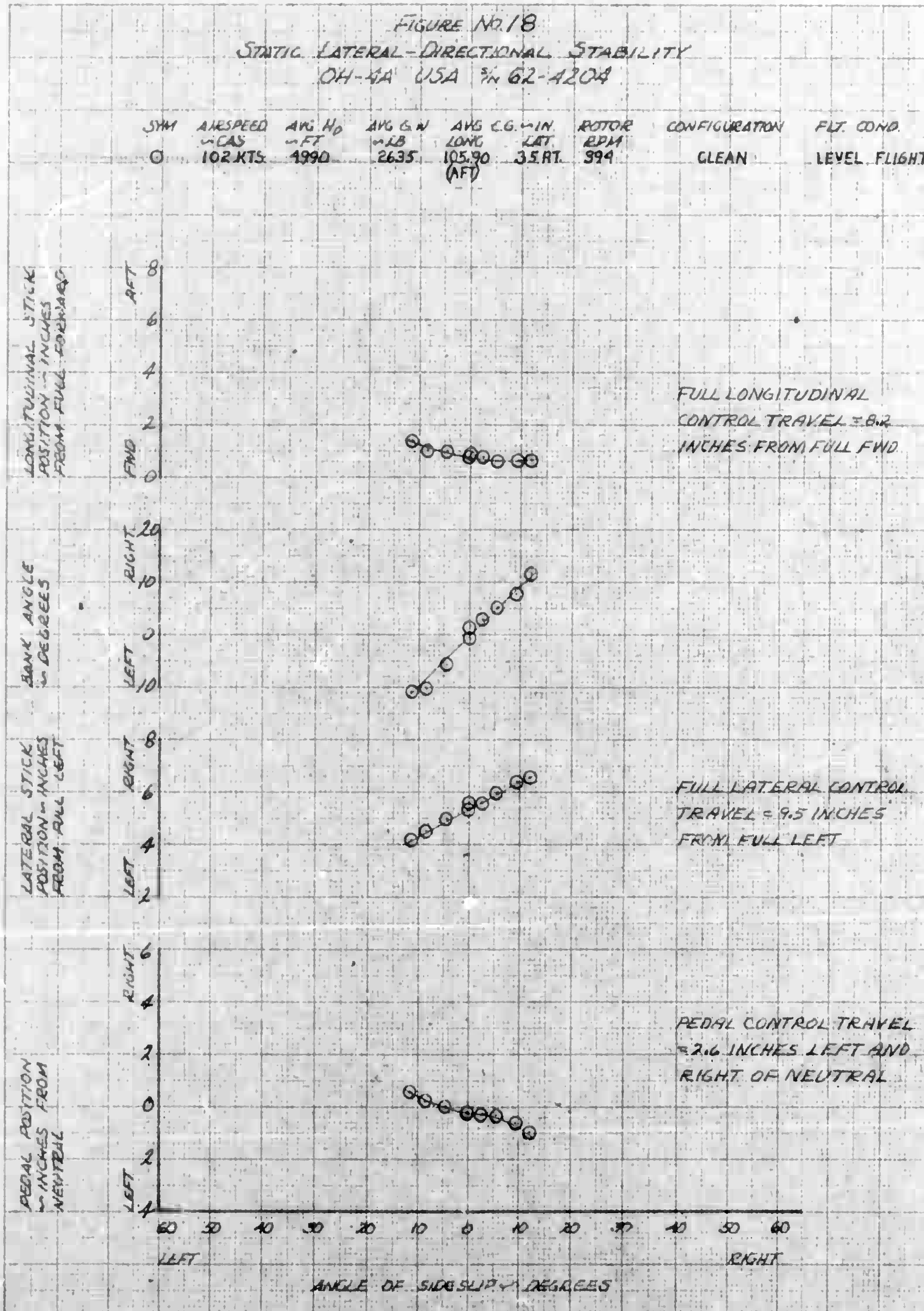
STATIC LATERAL-DIRECTIONAL STABILITY

OH-4A USA S/N 62-4204

SYM	AIRSPEED ~CAS	AVG H_p ~FT	AVG G.W ~LB	AVG C.G. ~IN. LONG	LAT.	ROTOR RPM	CONFIGURATION	FLT. COND.
O	92 KTS	4820	2585	105.60 (AFT)	.35 RT	394	CLEAN	LEVEL FLIGHT

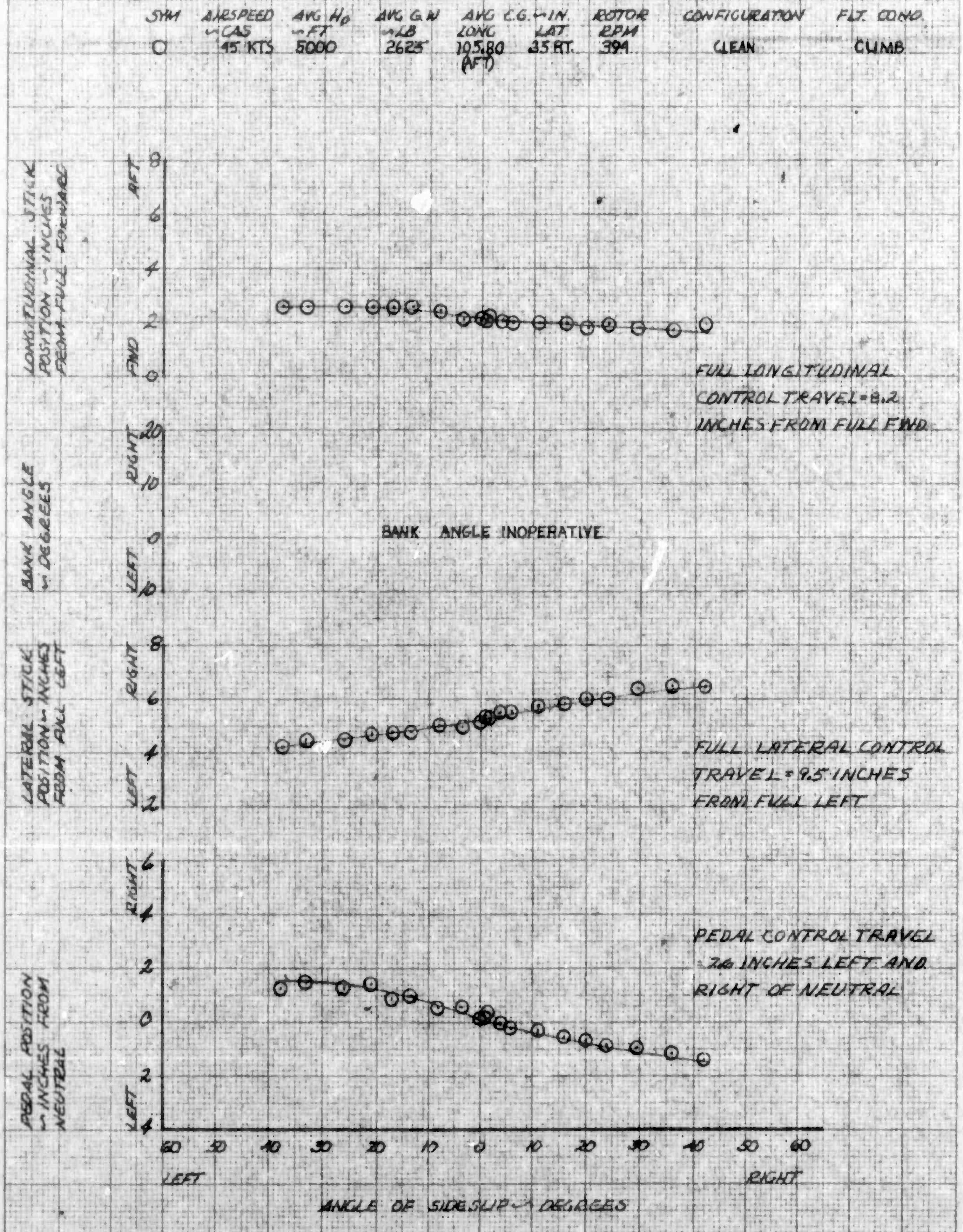


FOR OFFICAL USE ONLY



FOR OFFICAL USE ONLY

FIGURE NO. 19
STATIC LATERAL-DIRECTIONAL STABILITY
OH-4A USA S/N 62-4204



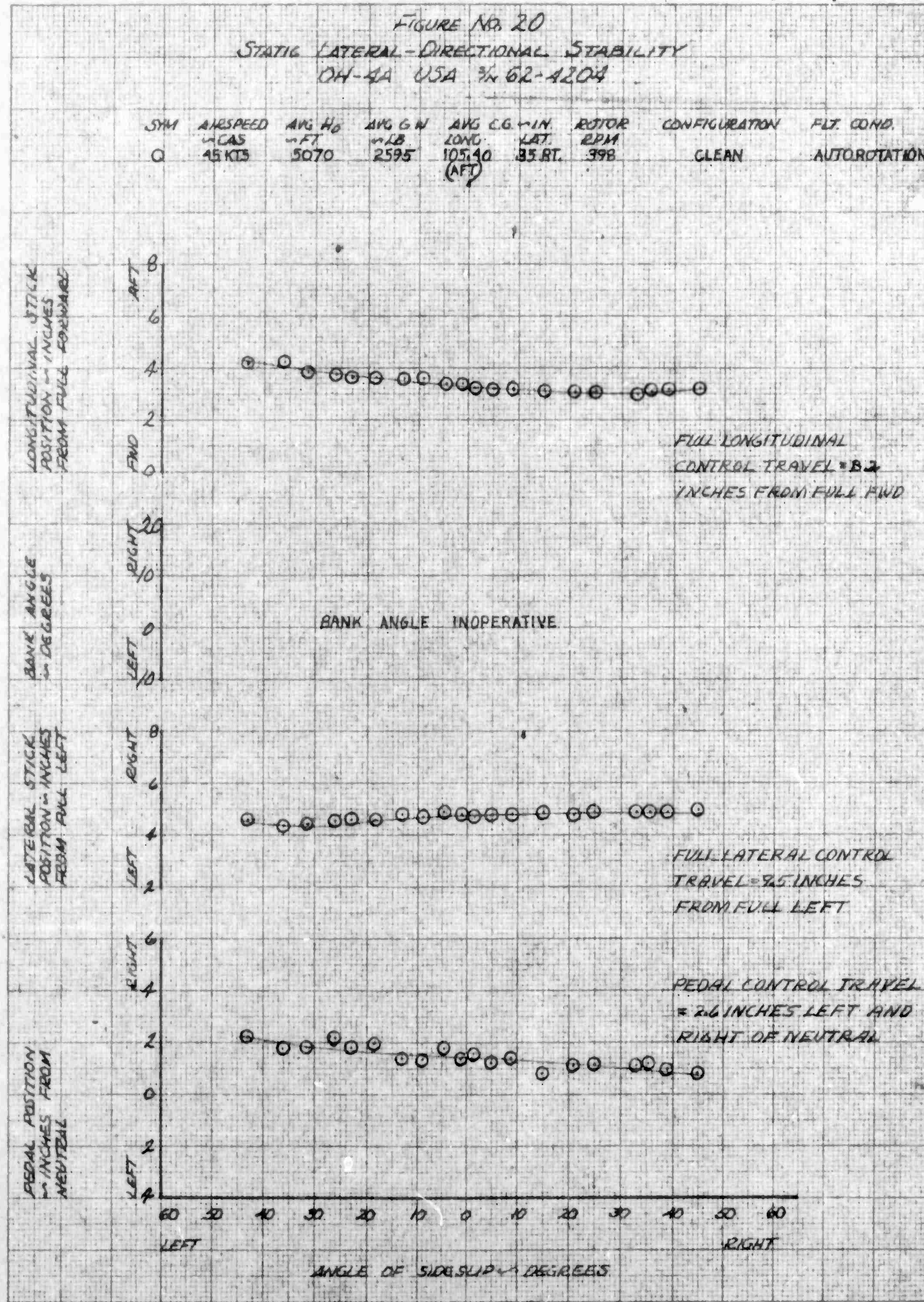


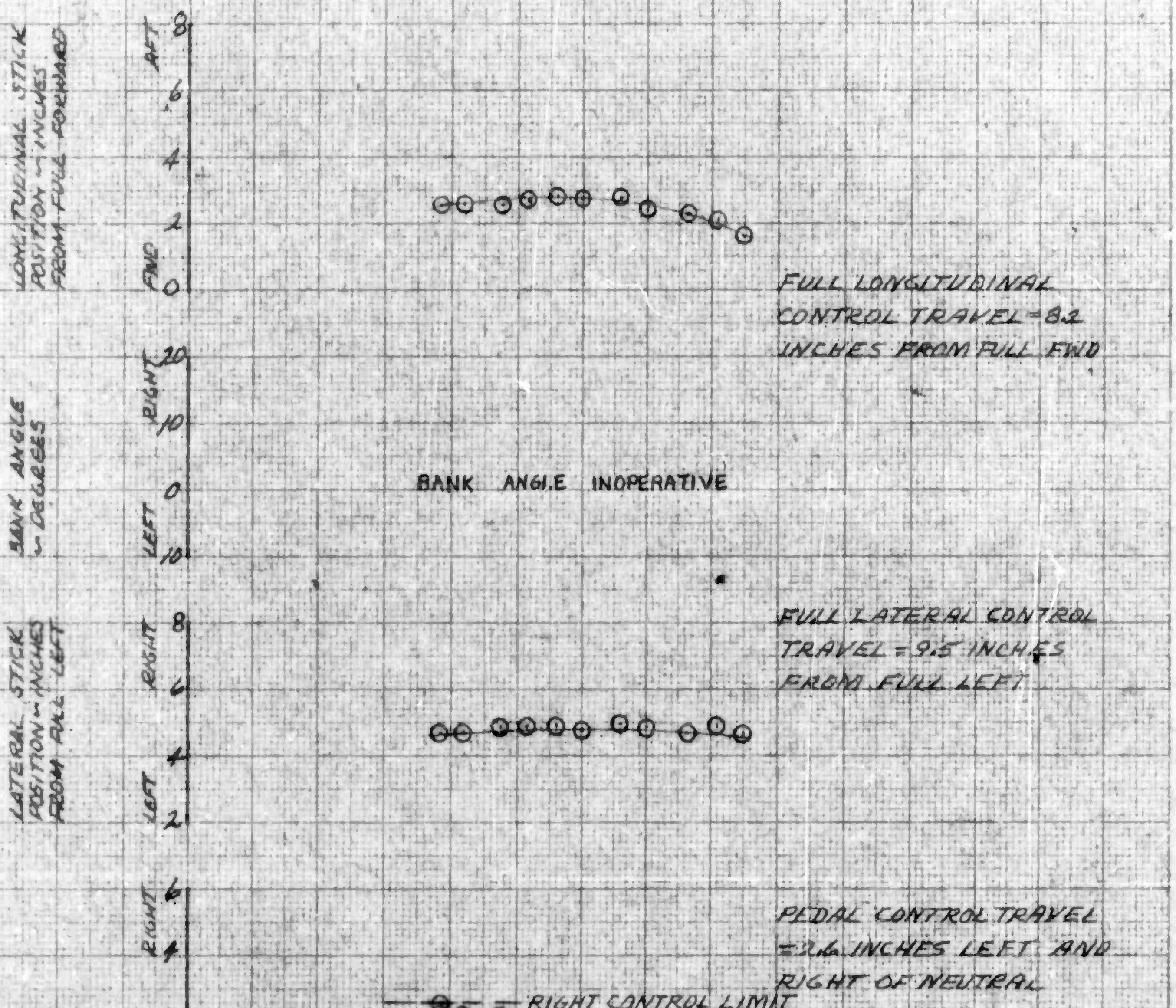
FIGURE NO. 20
STATIC LATERAL-DIRECTIONAL STABILITY
OH-4A USA S/N 62-4204
SYM
AIRSPEED ~ CAS
AVG H_0 ~ FT
AVG G.W. ~ LB
AVG C.G. ~ IN. LONG. LAT.
ROTOR RPM
CONFIGURATION
FLT. COND.
45 KTS
5070
2595
105.40 (AFT)
.35 RT.
398
CLEAN
AUTOROTATION
LONGITUDINAL STICK POSITION ~ INCHES FROM FULL FORWARD
AFT
FWD
FULL LONGITUDINAL CONTROL TRAVEL = 8.2 INCHES FROM FULL FWD
BANK ANGLE ~ DEGREES
RIGHT
LEFT
BANK ANGLE INOPERATIVE
LATERAL STICK POSITION ~ INCHES FROM FULL LEFT
FULL LATERAL CONTROL TRAVEL = 9.5 INCHES FROM FULL LEFT
PEDAL POSITION ~ INCHES FROM NEUTRAL
PEDAL CONTROL TRAVEL = 2.6 INCHES LEFT AND RIGHT OF NEUTRAL
LEFT
RIGHT
ANGLE OF SIDESLIP ~ DEGREES

FIGURE NO. 21

STATIC LATERAL-DIRECTIONAL STABILITY

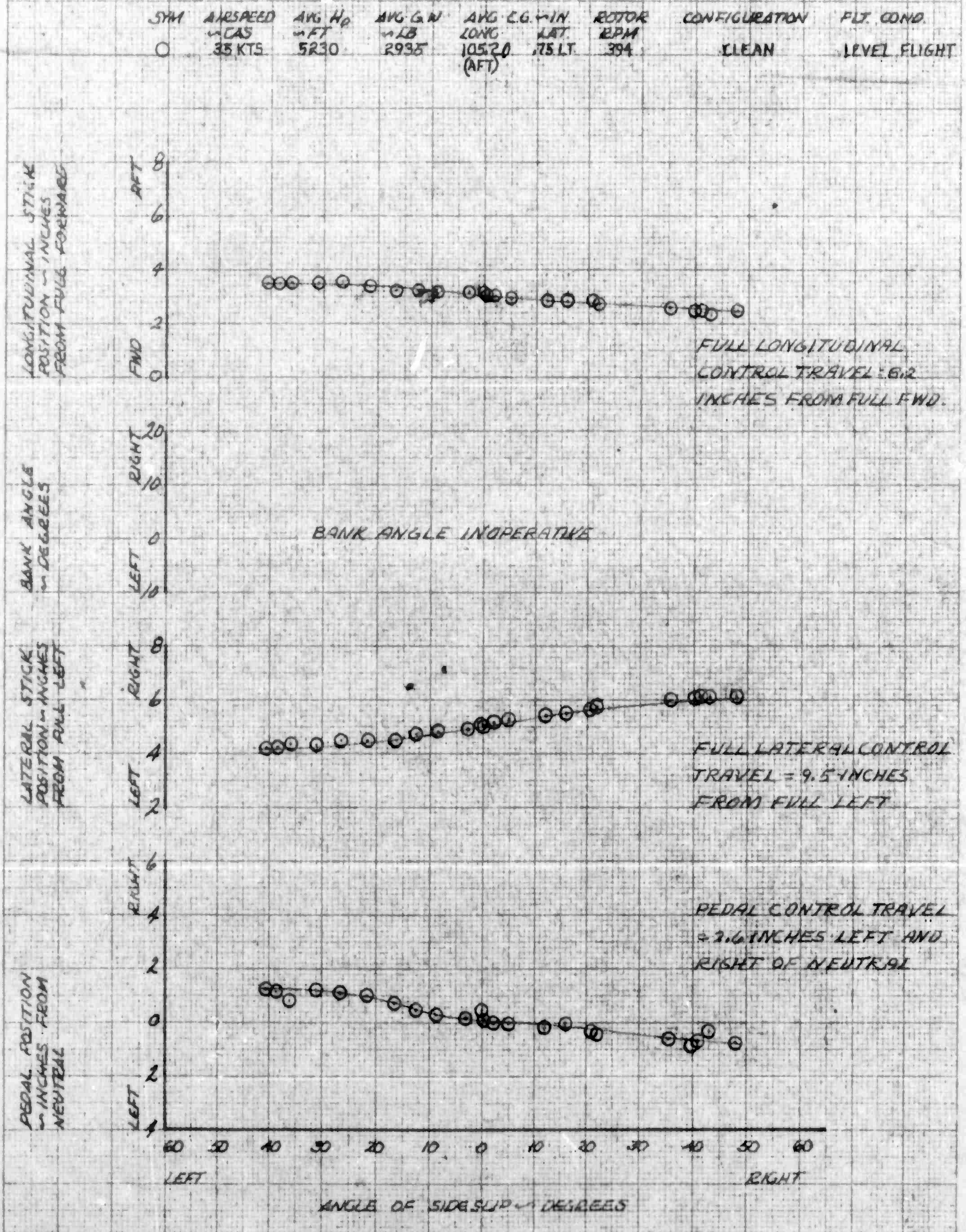
OH-4A USA S/N 62-4204

SYM	AIRSPEED ~CAS	AVG H_p ~FT	AVG G.W ~LB	AVG C.G ~IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT. COND
○	76 KTS	5000	2610	105.80 (AFT)	.35 RT	396	CLEAN	AUTOROTATION



FOR OFFICAL USE ONLY

FIGURE NO. 22
STATIC LATERAL-DIRECTIONAL STABILITY
OH-4A USA S/N 62-4204



FOR OFFICAL USE ONLY

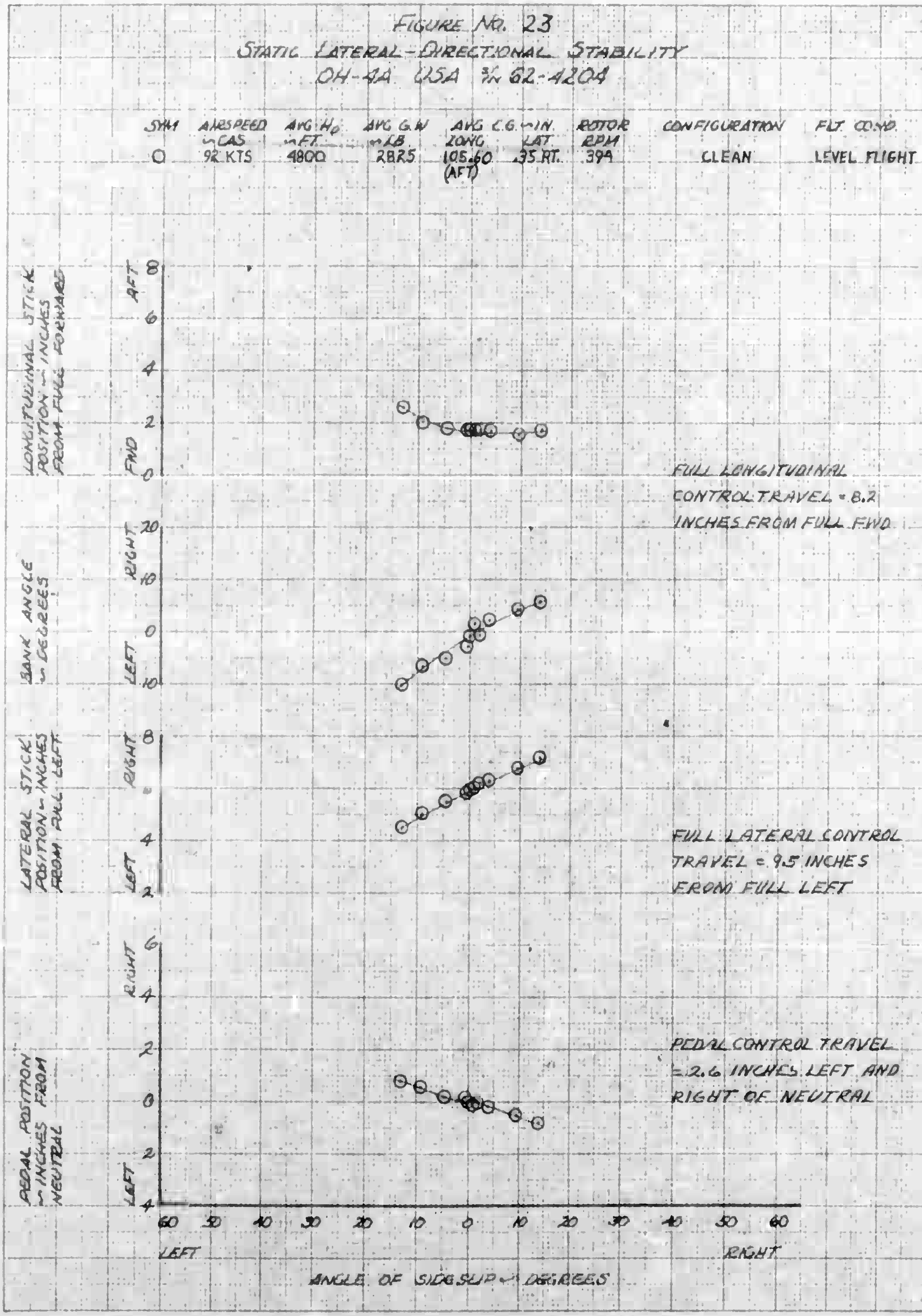


FIGURE NO. 23
STATIC LATERAL-DIRECTIONAL STABILITY
OH-4A USA S/N 62-4204
SYM
AIRSPEED ~ CAS
AVG H_p ~ FT
AVG G.W ~ LB
AVG C.G. ~ IN. LONG
LAT
ROTOR RPM
CONFIGURATION
FLT. COND.
92 KTS
4800
2825
105.60 (AFT)
.35 RT.
394
CLEAN
LEVEL FLIGHT
LONGITUDINAL STICK POSITION ~ INCHES FROM FULL FORWARD
AFT
FWD
FULL LONGITUDINAL CONTROL TRAVEL = 8.2 INCHES FROM FULL FWD
BANK ANGLE ~ DEGREES
RIGHT
LEFT
LATERAL STICK POSITION ~ INCHES FROM FULL LEFT
FULL LATERAL CONTROL TRAVEL = 9.5 INCHES FROM FULL LEFT
PEDAL POSITION ~ INCHES FROM NEUTRAL
PEDAL CONTROL TRAVEL = 2.6 INCHES LEFT AND RIGHT OF NEUTRAL
LEFT
RIGHT
ANGLE OF SIDESLIP ~ DEGREES

FIGURE NO. 24

STATIC LATERAL-DIRECTIONAL STABILITY

OH-4A USA S/N 62-4204

SYM	AIRSPEED ~CAS	AVG. H_D ~FT.	AVG. G.W. ~LB	AVG. C.G. ~IN. LONG.	AVG. C.G. ~IN. LAT.	ROTOR RPM	CONFIGURATION	FLT. COND.
○	100 KTS	5030	2845	104.80 (AFT)	.75 LT.	394	CLEAN	LEVEL FLIGHT

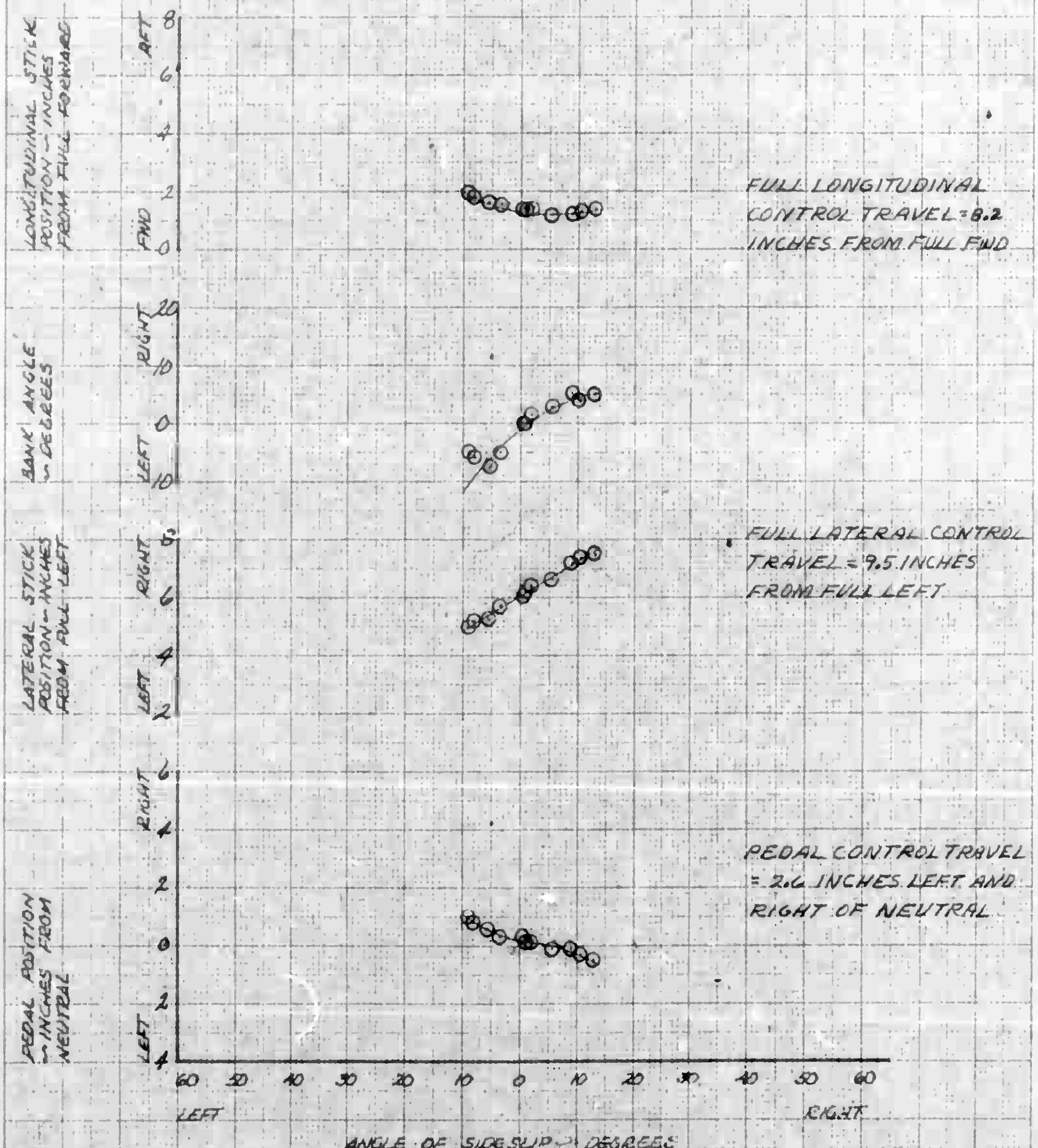
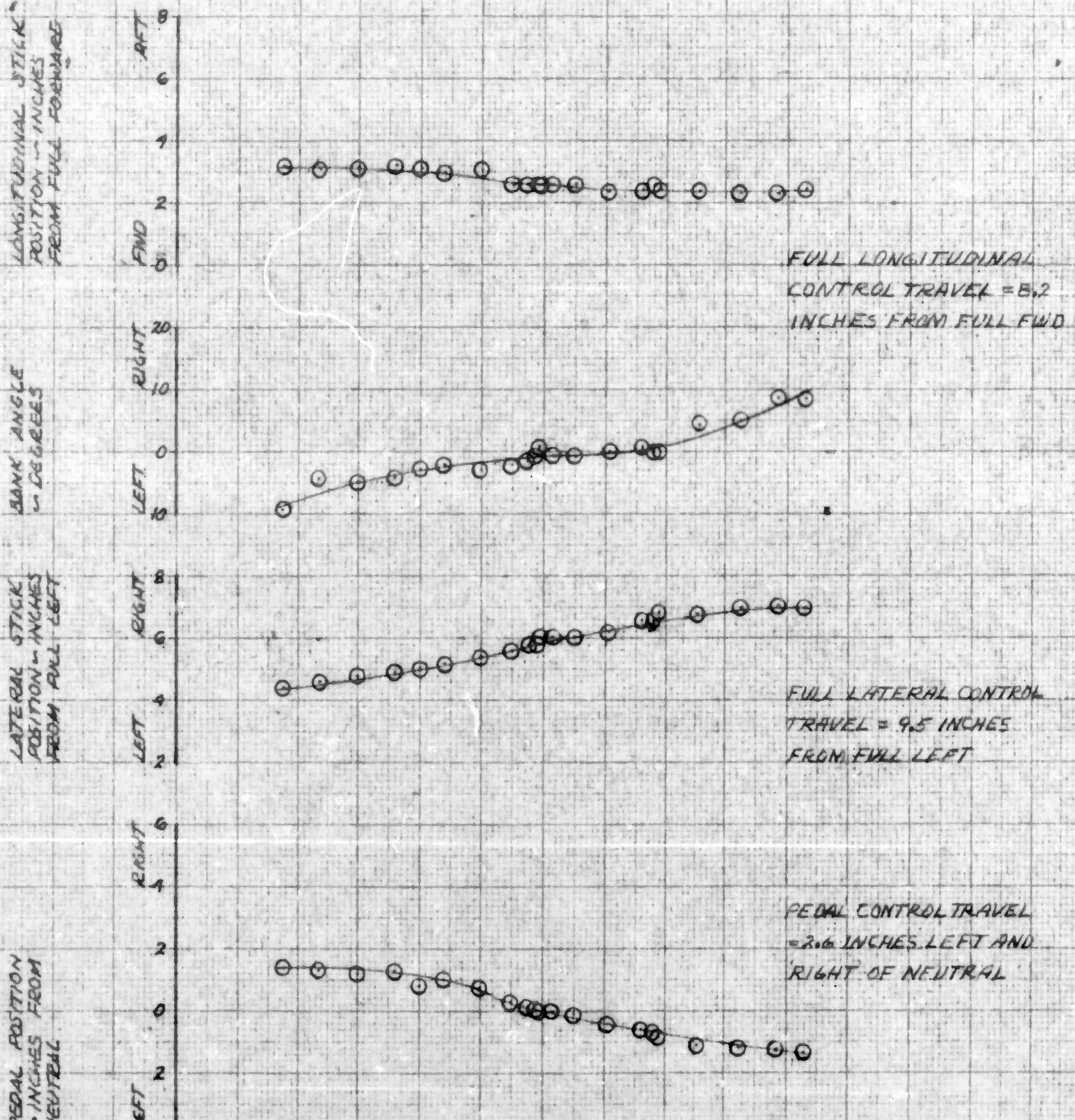


FIGURE NO. 25

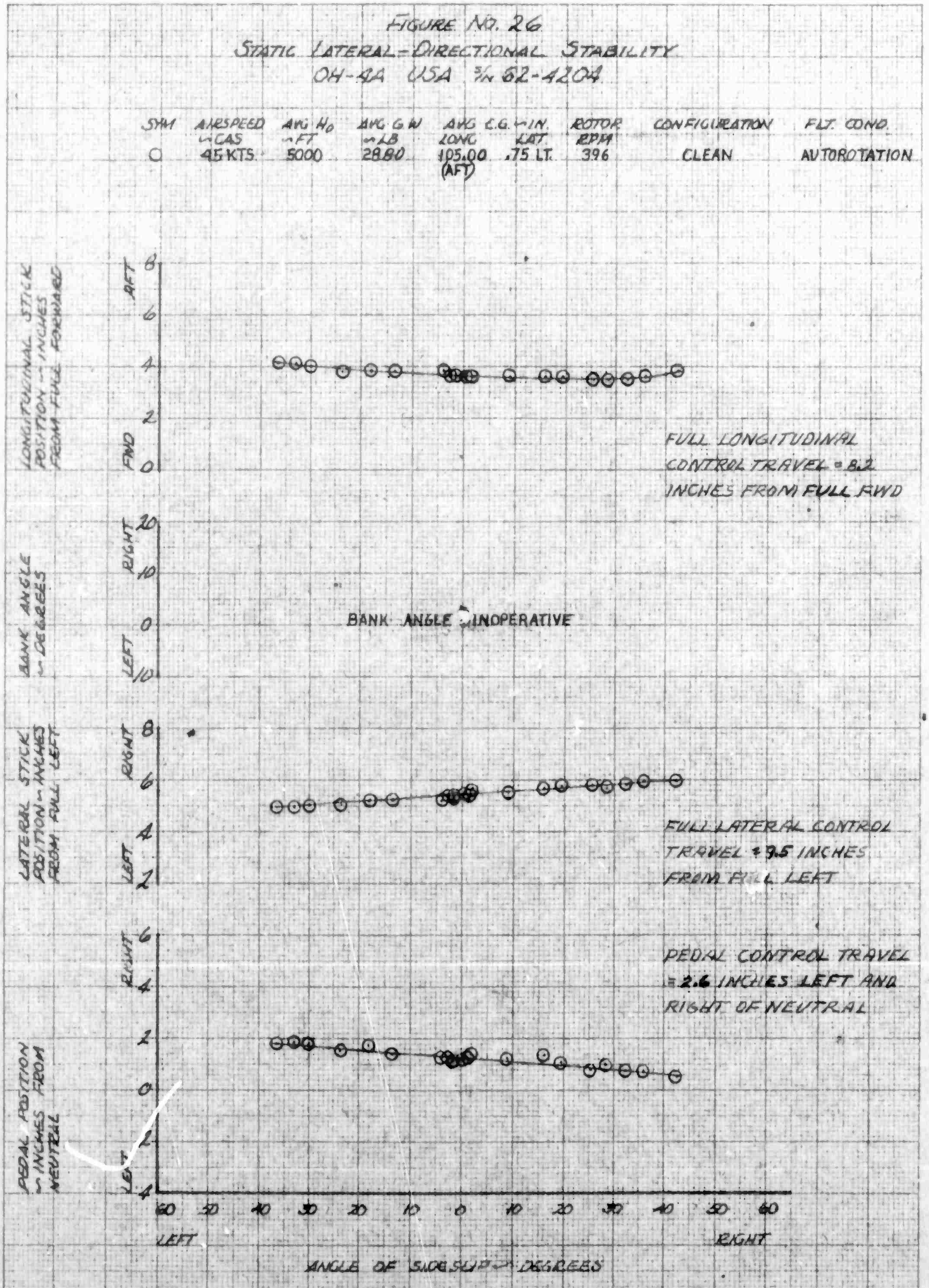
STATIC LATERAL-DIRECTIONAL STABILITY

OH-4A USA S/N 62-4204

SYM	AIRSPEED ~CAS	AVG H_O ~FT	AVG G.W ~LB	AVG C.G. ~ IN. LONG	LAT.	ROTOR RPM	CONFIGURATION	FLT. COND.
⊙	45 KTS	5000	2840	104.80 (AFT)	.75 LT.	394	CLEAN	CLIMB



FOR OFFICAL USE ONLY



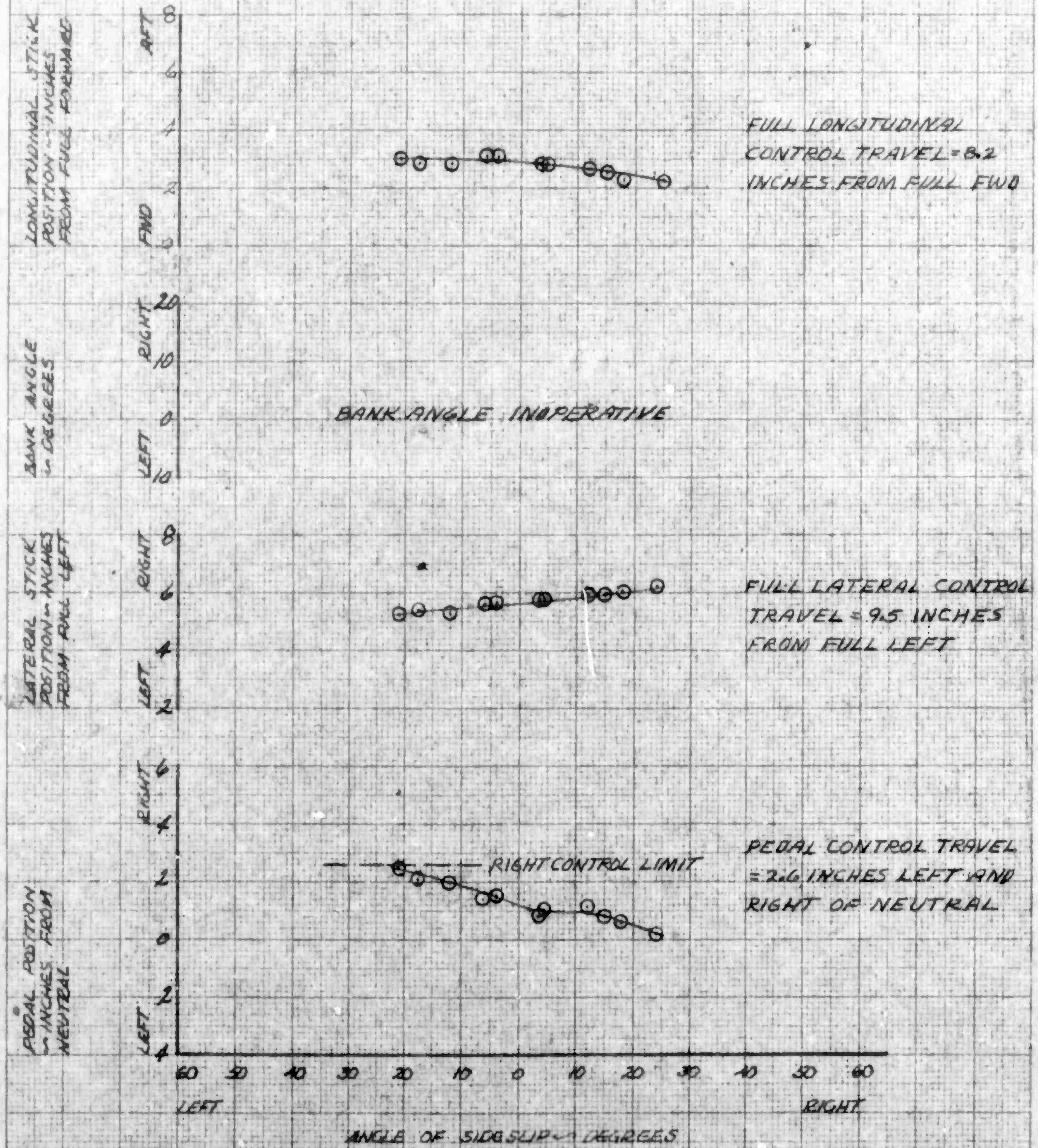
FOR OFFICAL USE ONLY

FIGURE NO. 27

STATIC LATERAL-DIRECTIONAL STABILITY

OH-4A USA S/N 62-4204

SYM	AIRSPEED ~ CAS	AVG H_0 ~ FT	AVG G.W. ~ LB	AVG C.G. ~ IN. LONG	AVG C.G. ~ IN. LAT.	ROTOR RPM	CONFIGURATION	FLT. COND.
○	74.5 KTS	5000	2880	103.00 (AFT)	.75 LT.	392	CLEAN	AUTOROTATION



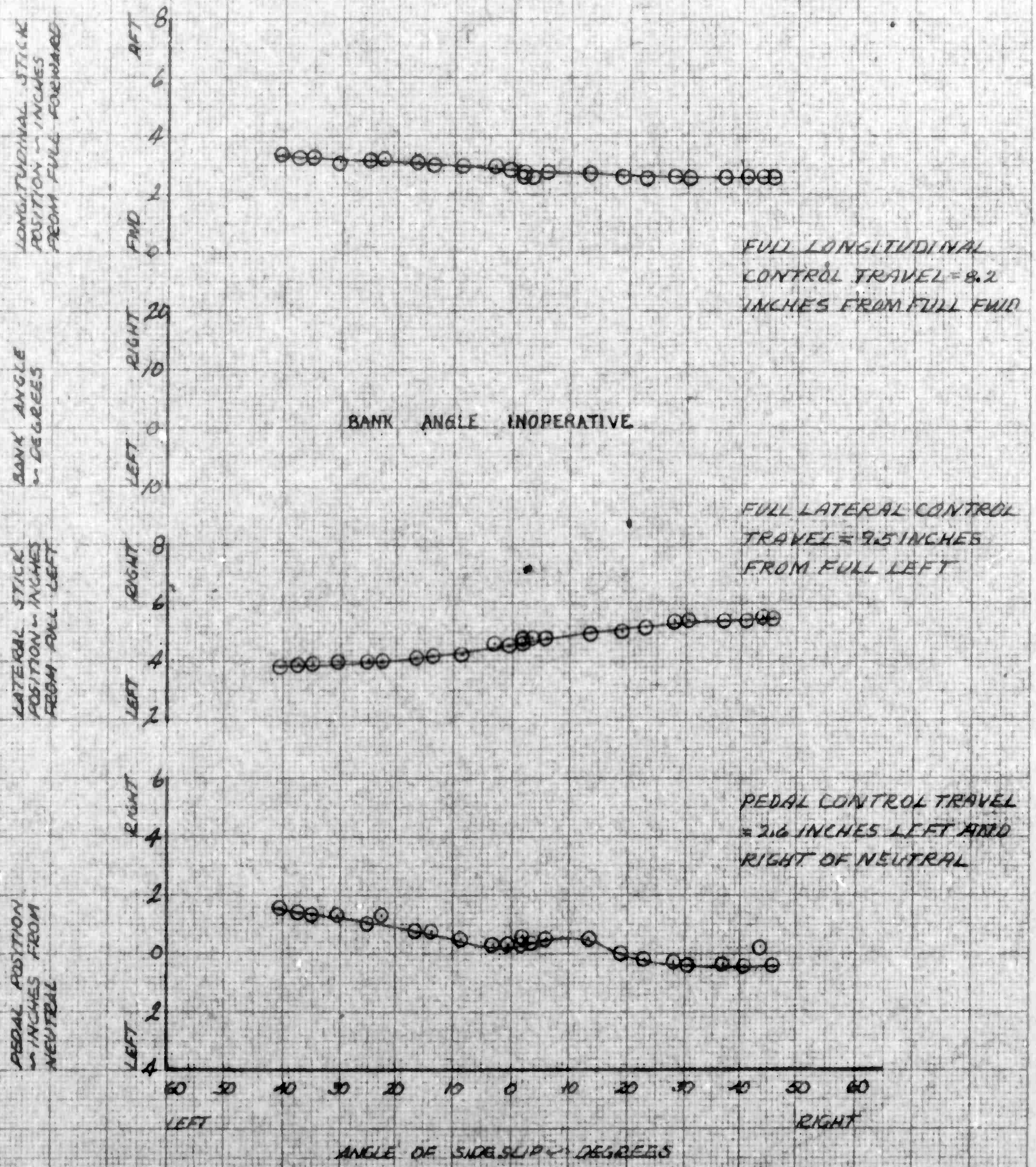
FOR OFFICAL USE ONLY

FIGURE NO. 28

STATIC LATERAL-DIRECTIONAL STABILITY

OH-4A USA S/N 62-4204

SYM	AIRSPEED ~CAS	AVG H_0 ~FT	AVG G.W ~LB	AVG C.G. ~IN. LONG	AVG C.G. ~IN. LAT	ROTOR RPM	CONFIGURATION	FLT. COND.
○	35 KTS	10200	2490	109.20 (AFT)	.35 RT	394	CLEAN	LEVEL FLIGHT



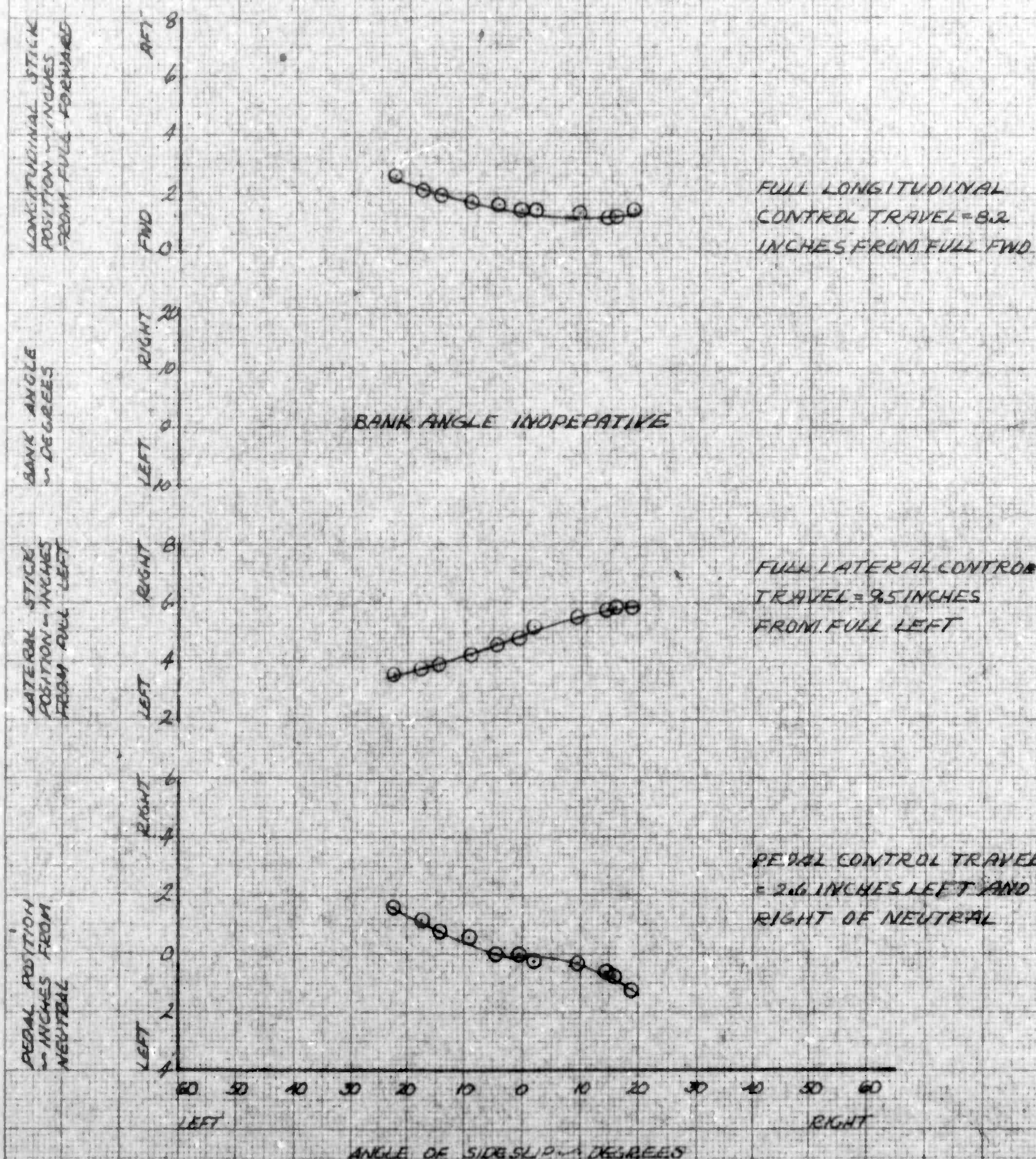
FOR OFFICAL USE ONLY

FIGURE NO. 29

STATIC LATERAL-DIRECTIONAL STABILITY

OH-4A USA S/N 62-4204

SYM	AIRSPEED ~CAS	AVG H_D ~FT	AVG G.W ~LB	AVG C.G. ~IN. LONG	LAT.	ROTOR RPM	CONFIGURATION	FLT. COND.
O	75 KTS	9[illegible]85	2615	105.80 (AFT)	.35 RT.	394	CLEAN	LEVEL FLIGHT



FOR OFFICAL USE ONLY

FIGURE NO. 30
STATIC LATERAL-DIRECTIONAL STABILITY
OH-4A USA S/N 62-4204

SYM	AIRSPEED ~CAS	AVG H_p ~FT	AVG G.W. ~LB	AVG C.G. ~IN. LONG	LAT.	ROTOR RPM	CONFIGURATION	FLT. COND.
○	92 KTS	10370	2456	105.00 (AFT)	.35 RT	394	CLEAN	LEVEL FLIGHT

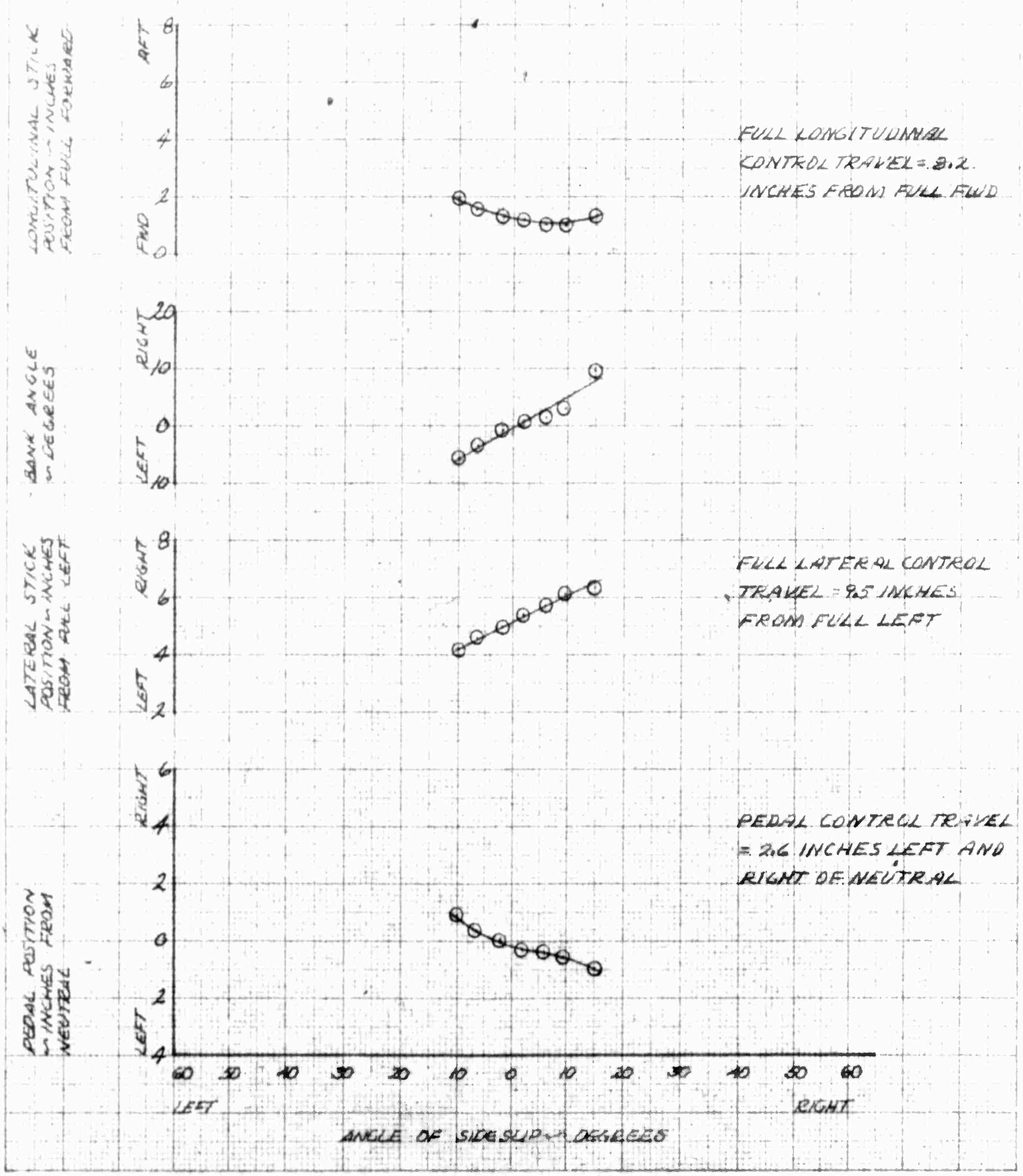


FIGURE NO. 31

STATIC LATERAL-DIRECTIONAL STABILITY

OH-4A USA S/N 62-4204

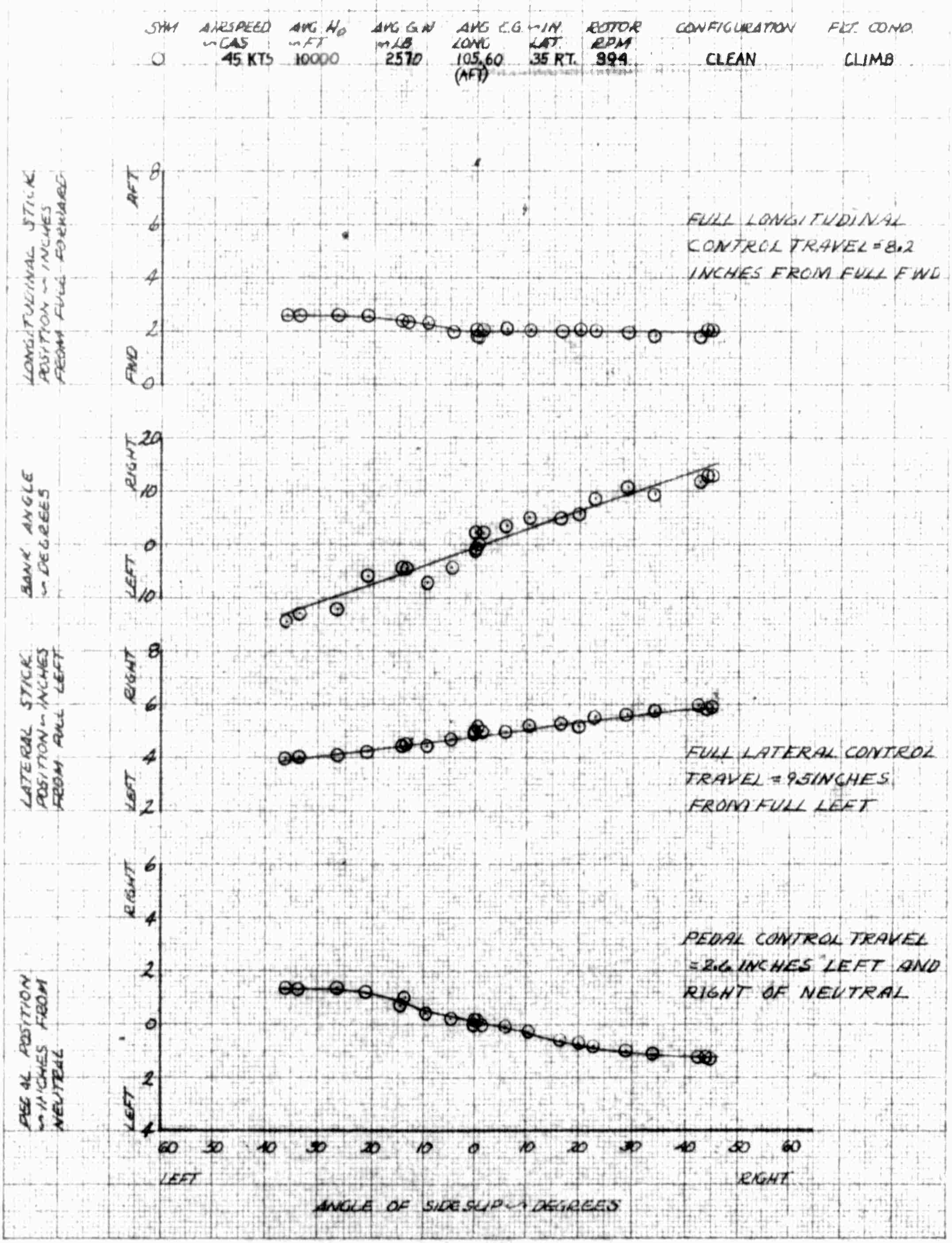
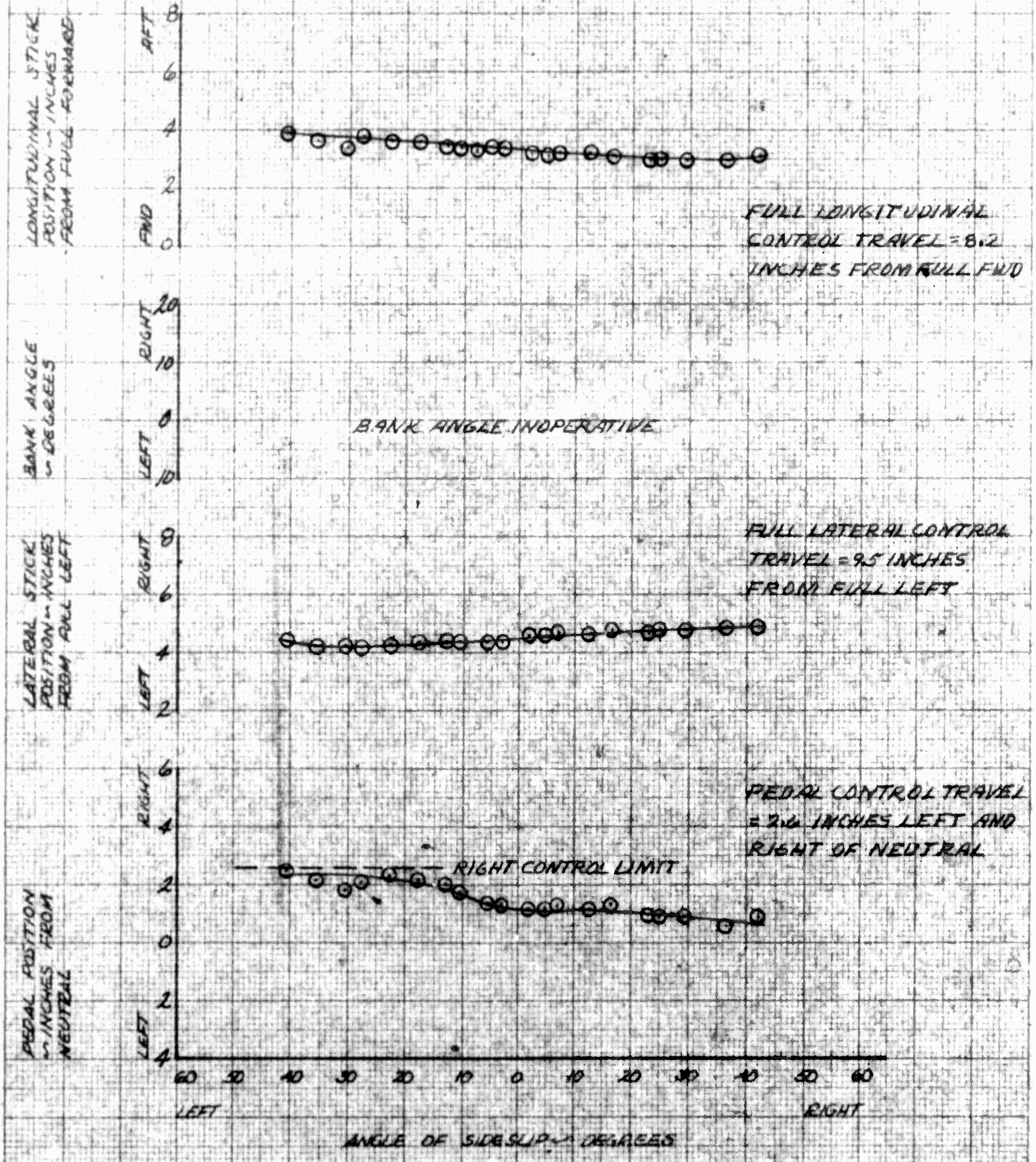


FIGURE NO. 32

STATIC LATERAL-DIRECTIONAL STABILITY

OH-4A USA S/N 62-4204

SYM	AIRSPEED ~CAS	AVG H_0 ~FT	AVG G.W ~LB	AVG C.G. ~IN. LONG	LAT	ROTOR RPM	CONFIGURATION	FLT. COND.
○	45 KTS	10000	2550	105.50 (AFT)	.35 RT.	398	CLEAN	AUTOROTATION



FOR OFFICAL USE ONLY

FIGURE NO. 33

STATIC LATERAL-DIRECTIONAL STABILITY

OH-4A USA S/N 62-4204

SYM	AIRSPEED ~ CAS	AVG H_p ~ FT	AVG G.W. ~ LB	AVG C.G. ~ IN. LONG	LAT	ROTOR RPM	CONFIGURATION	FLT. COND.
○	75 KTS.	10000	2565	105.50 (AFT)	.35 LT.	399	CLEAN	AUTOROTATION

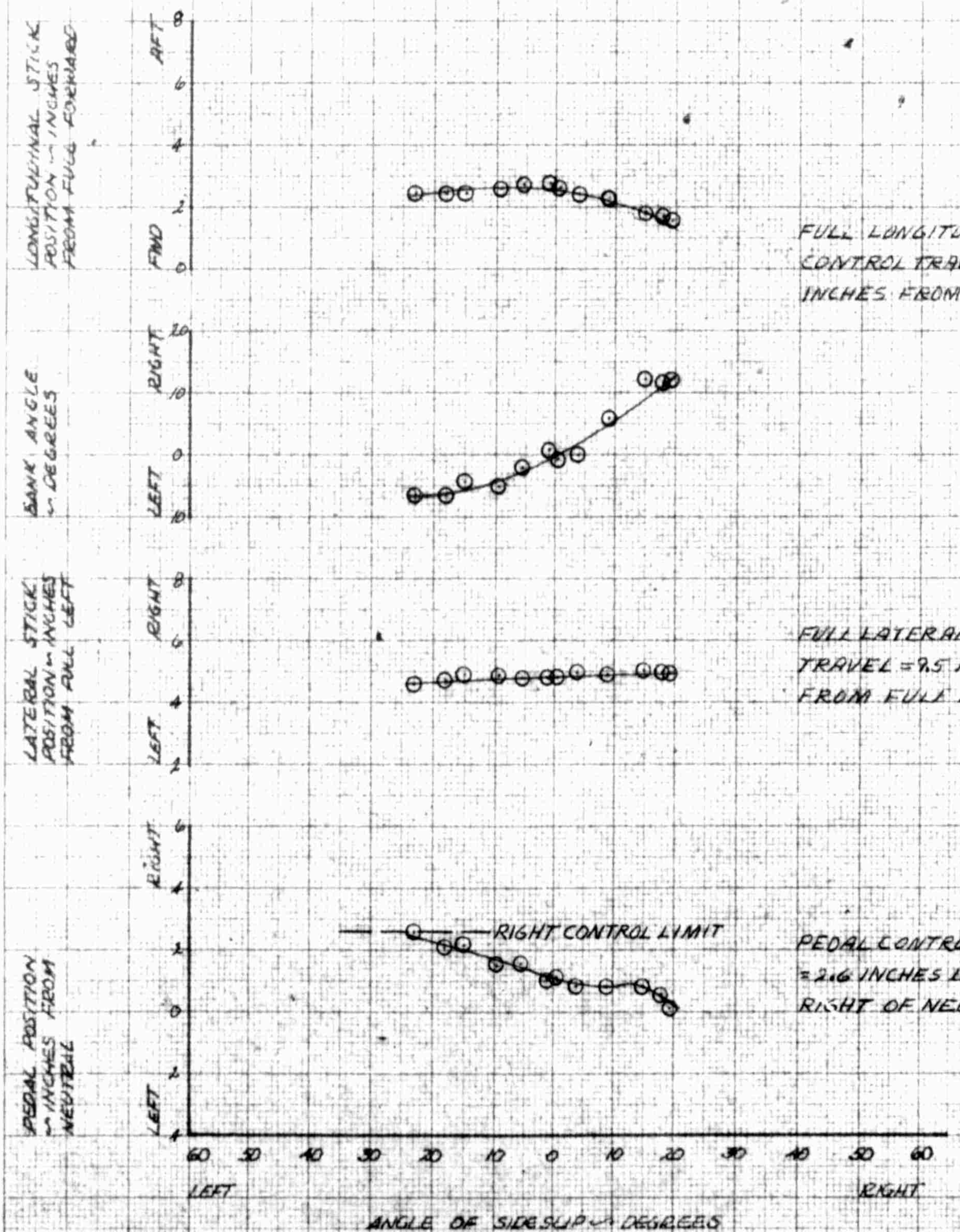


FIGURE NO. 34
STATIC LATERAL-DIRECTIONAL STABILITY
OH-4A USA S/N 62-4204

SYM	AIRSPEED ~CAS	AVG H_p ~FT	AVG G.W. ~LB.	AVG C.G. ~IN. LONG	LAT.	ROTOR RPM	CONFIGURATION	FLT. COND.
○	35 KTS.	5050	2590	104.80 (AFT)	1.25 LT	391	XM-7	LEVEL FLIGHT

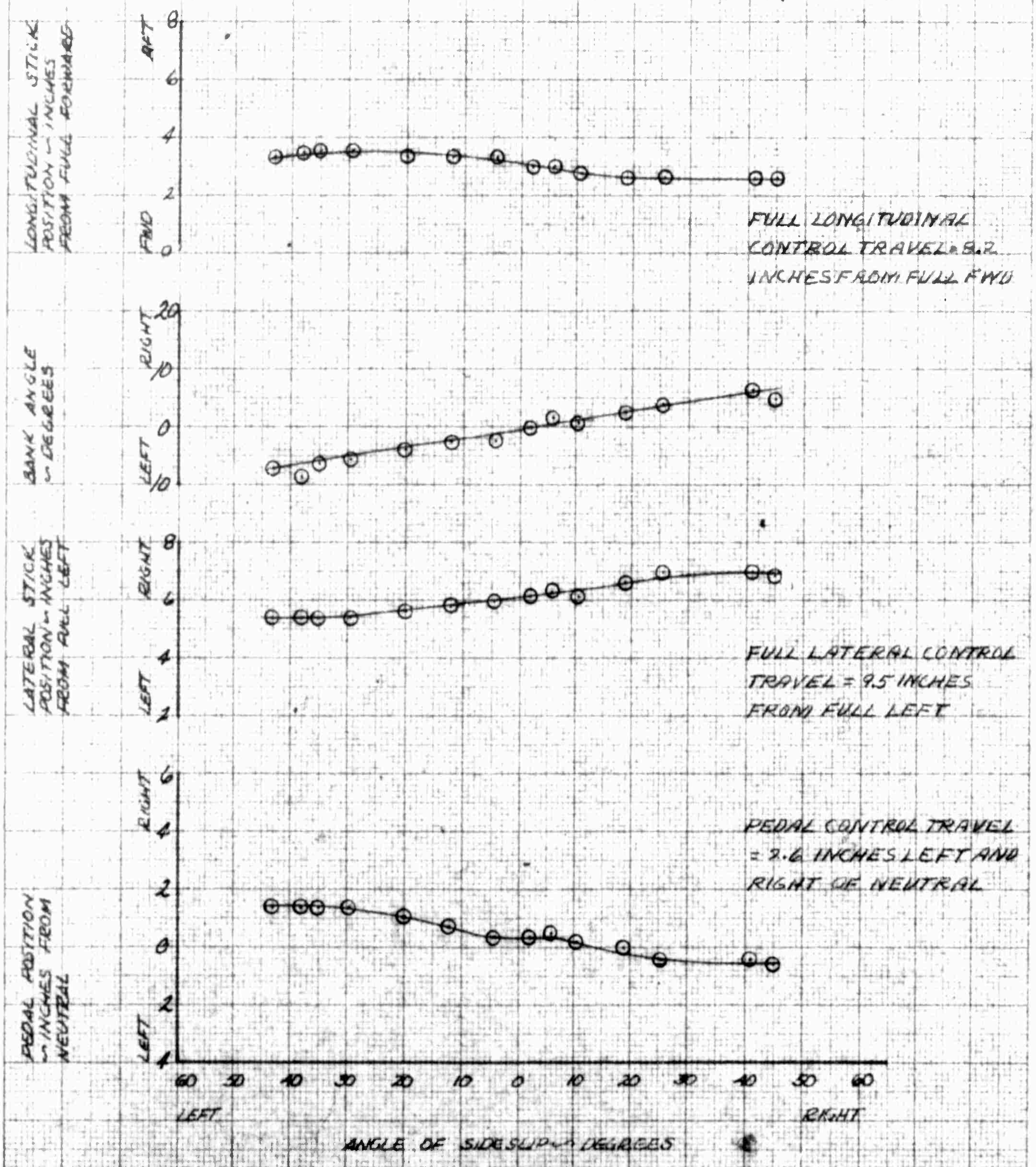
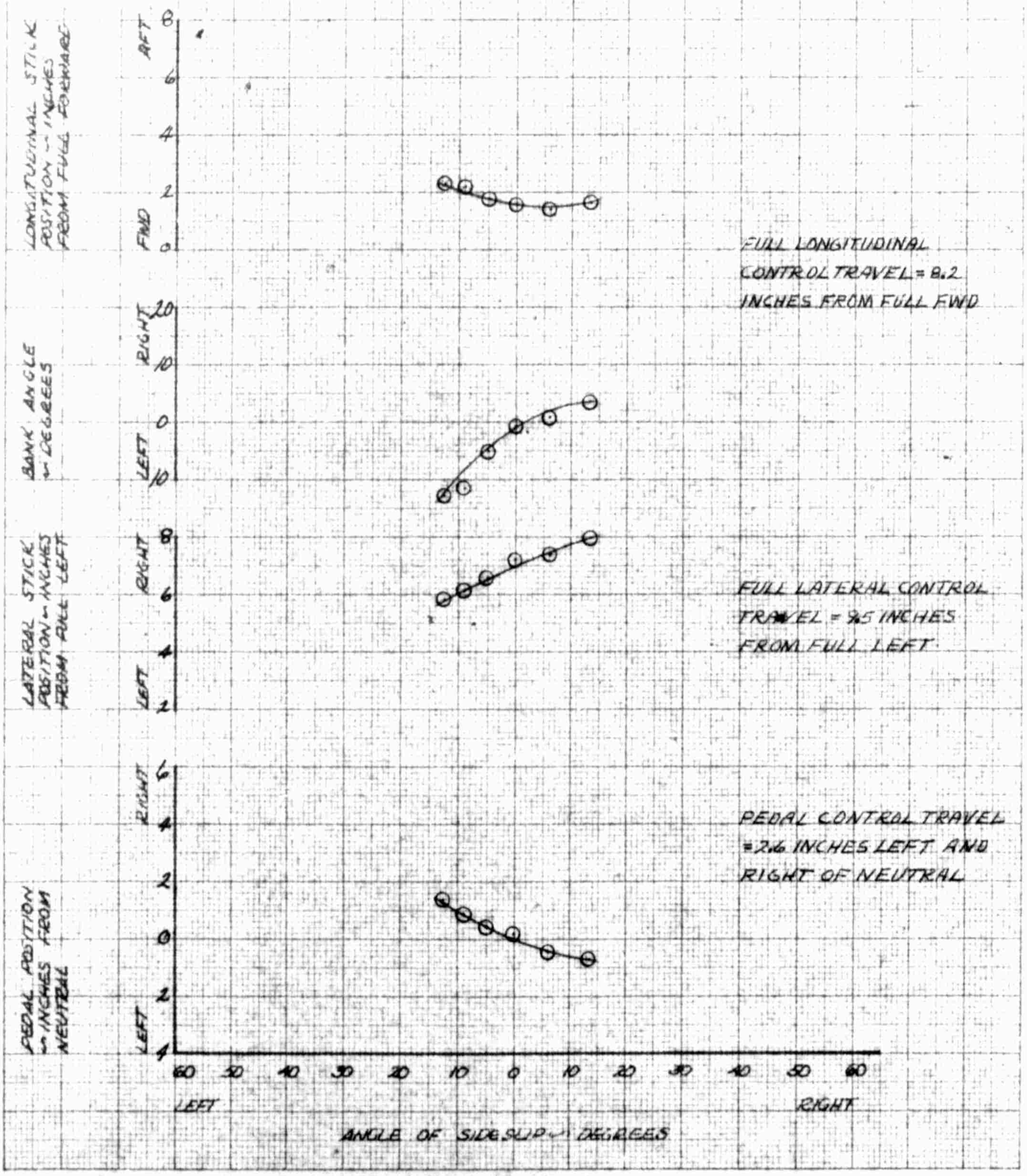


FIGURE NO. 35

STATIC LATERAL-DIRECTIONAL STABILITY

OH-4A USA S/N 62-4204

SYM	AIRSPEED ~CAS	AVG H_p ~FT	AVG G.W ~LB	AVG C.G ~IN. LONG	LAT	ROTOR RPM	CONFIGURATION	FLT. COND.
O	92 KTS	5000	2600	104.80 (AFT)	1.25 LT.	394	XM-7	LEVEL FLIGHT



FOR OFFICAL USE ONLY

FIGURE NO. 36
STATIC LATERAL-DIRECTIONAL STABILITY
OH-4A USA S/N 62-4204

SYM	AIRSPEED ~CAS	AVG H_p ~FT	AVG G.W ~LB	AVG C.G ~IN LONG	AVG C.G ~IN LAT.	ROTOR RPM	CONFIGURATION	FLT. COND.
○	42 KTS.	5000	2630	105.0 (AFT)	1.25 LT.	394	XM-7	CLIMB

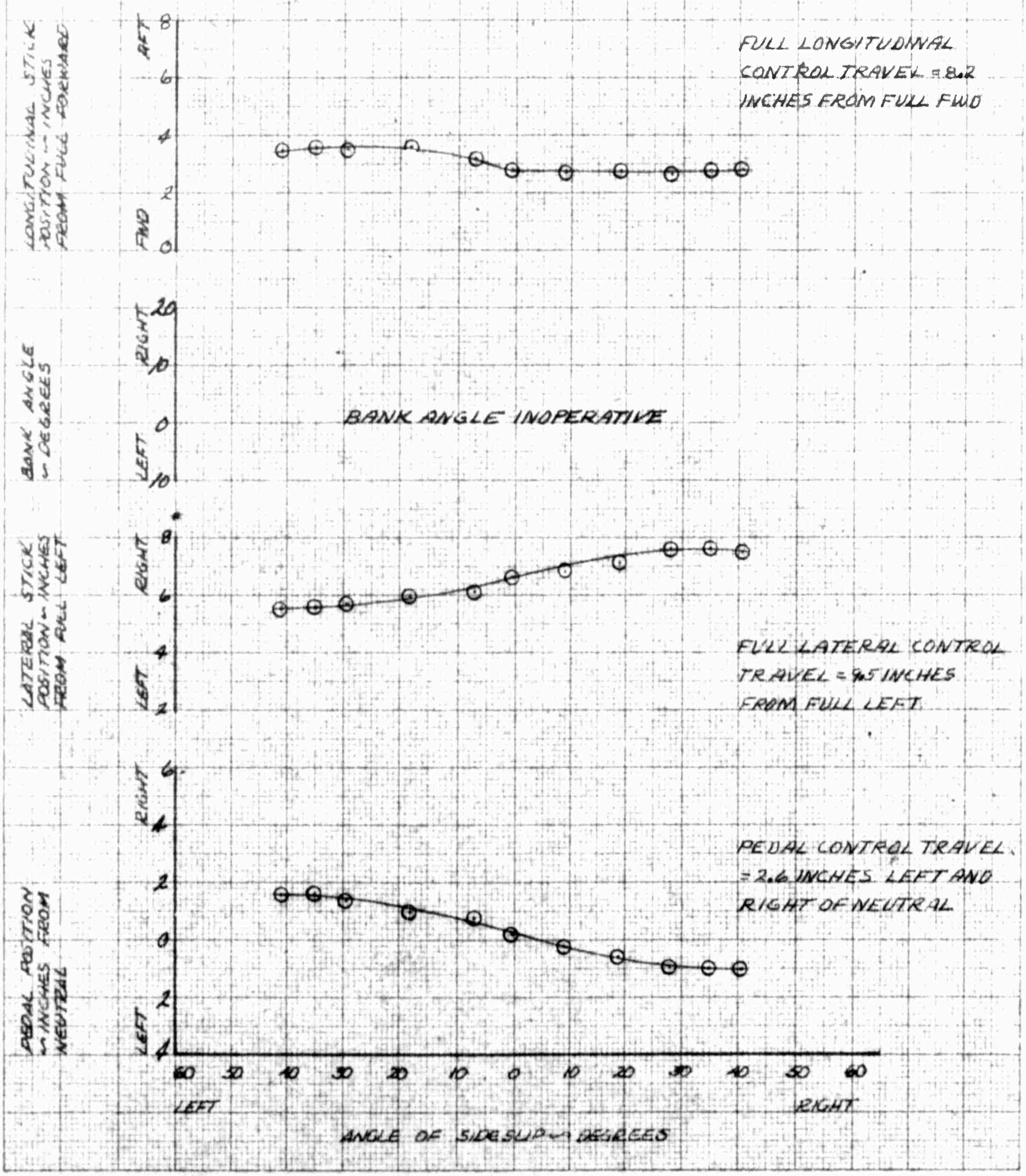
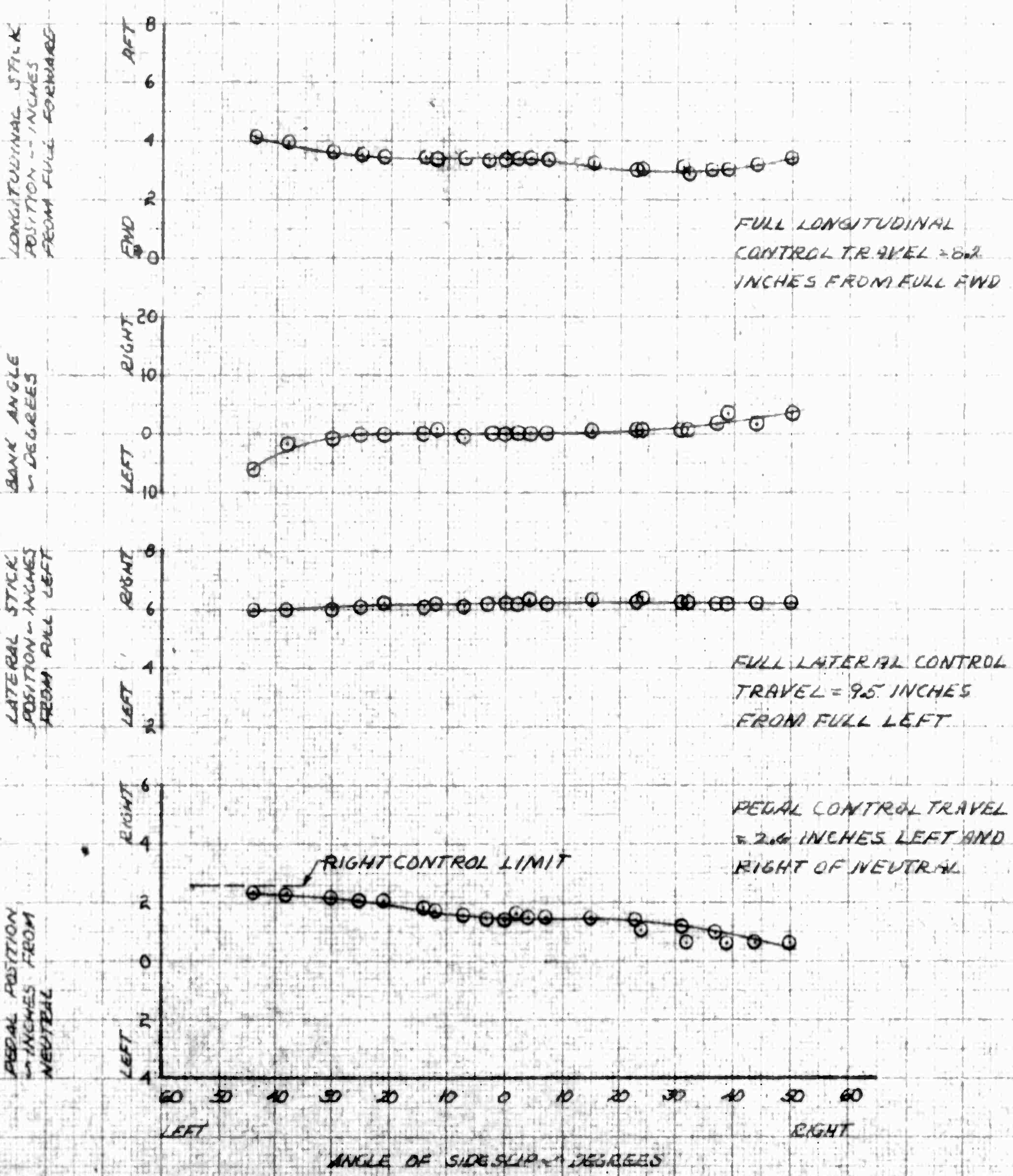


FIGURE NO. 37

STATIC LATERAL-DIRECTIONAL STABILITY

OH-4A USA S/N 62-4204

SYM	AIRSPEED ~CAS	AVG H_p ~FT	AVG G.W ~LB	AVG C.G. ~ IN. LONG	LAT	ROTOR RPM	CONFIGURATION	FLT. COND
O	45 KTS	5000	2555	104.50 (AFT)	1.25 LT.	394	XM-7	AUTOROTATION



FOR OFFICAL USE ONLY

FIGURE NO. 38
STATIC LATERAL-DIRECTIONAL STABILITY
OH-4A USA S/N 62-4204

SYM	AIRSPEED ~CAS	AVG H_p ~FT	AVG G.W. ~LB	AVG C.G. ~IN. LONG	LAT	ROTOR RPM	CONFIGURATION	FLT. COND.
○	35 KTS	5200	2620	105.00 (AFT)	1.30 LT.	394	XM-8	LEVEL FLIGHT

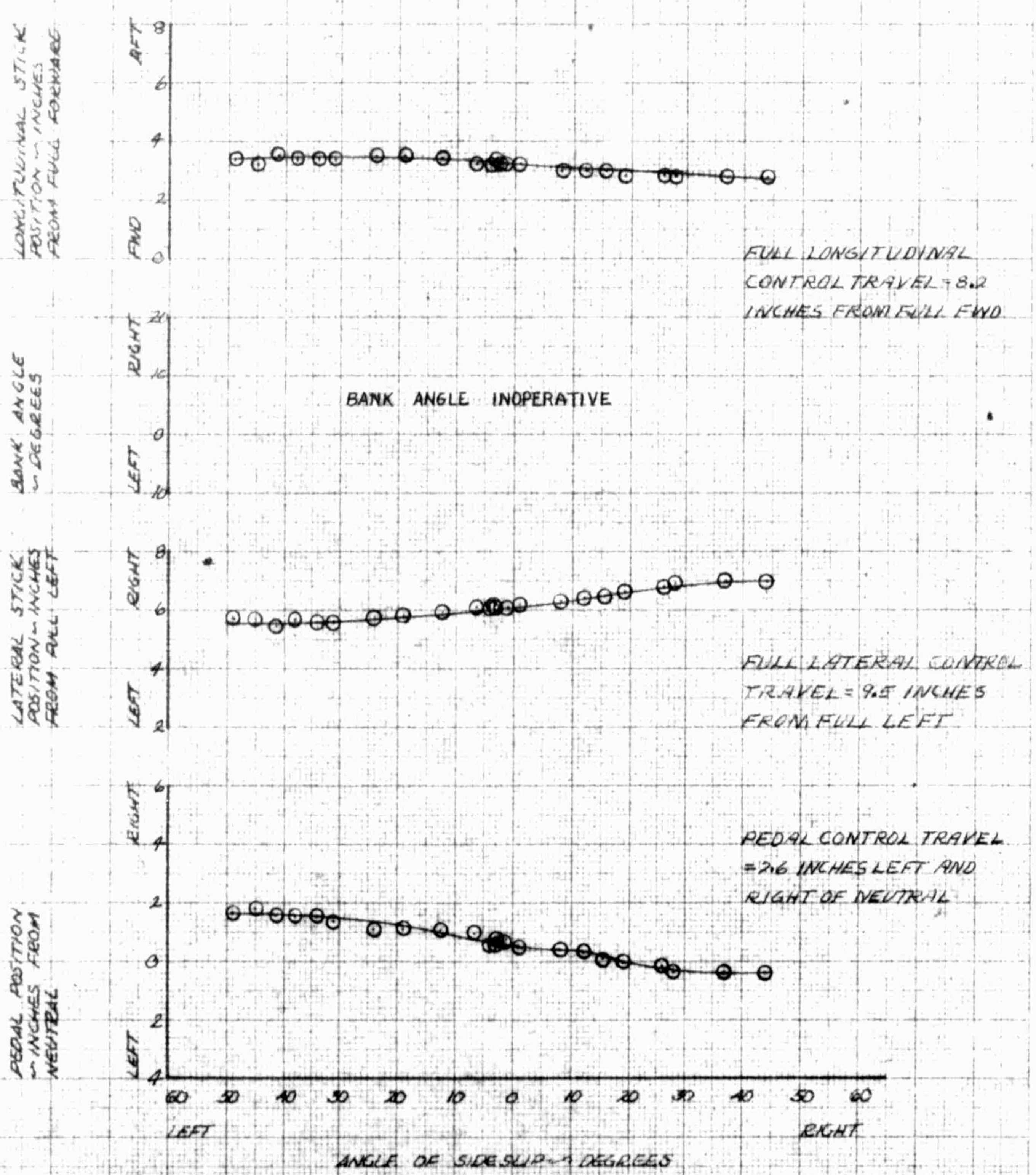


FIGURE NO. 39

STATIC LATERAL-DIRECTIONAL STABILITY

OH-4A USA S/N 62-4204

SYM	AIRSPEED ~ CAS	AVG H_0 ~ FT	AVG G.W. ~ LB	AVG C.G. ~ IN. LONG	AVG C.G. ~ IN. LAT.	ROTOR RPM	CONFIGURATION	FLT. COND.
○	92 KTS	5200	2550	105.10 (AFT)	1.30 LT.	394	XM-8	LEVEL FLIGHT

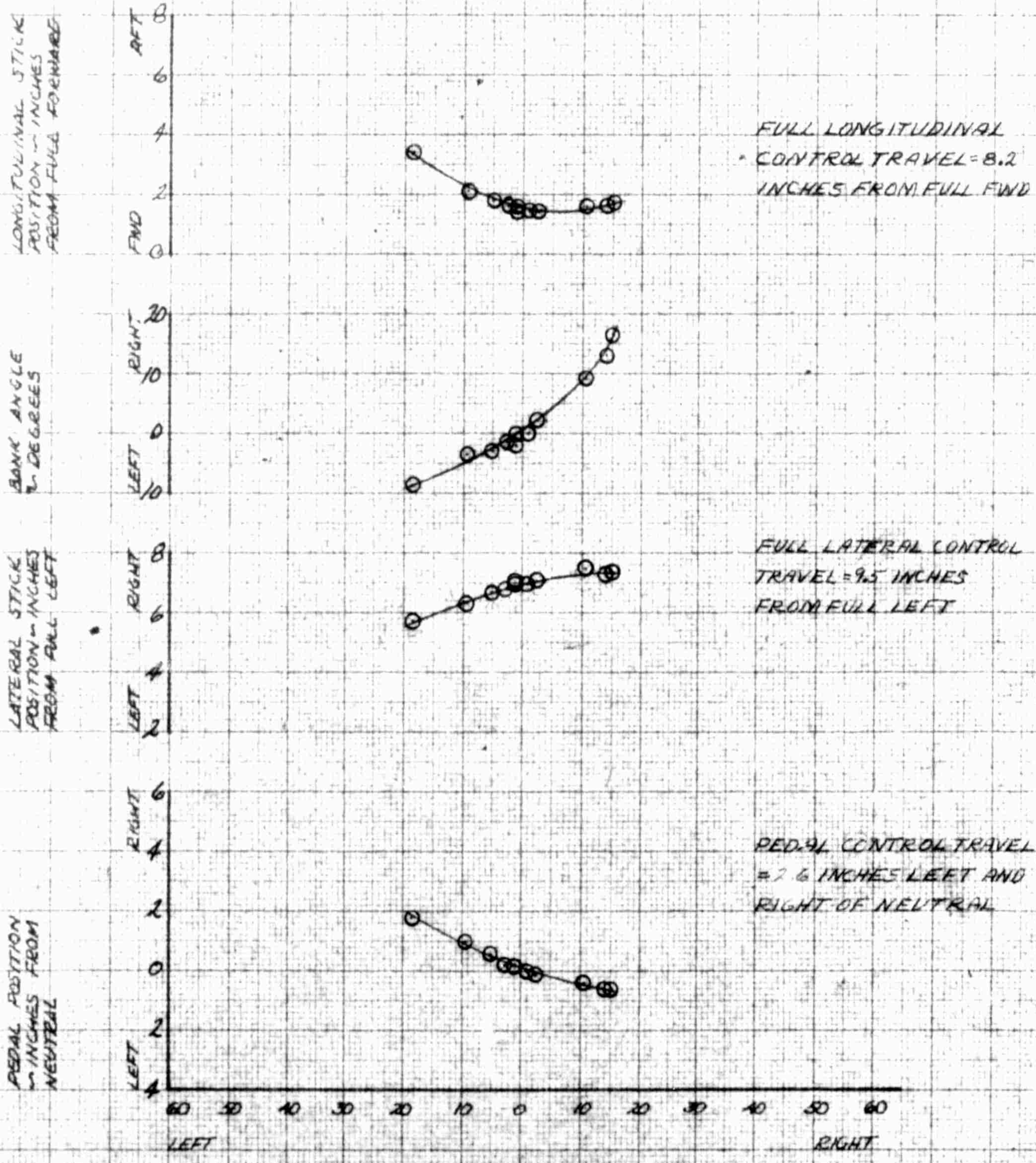
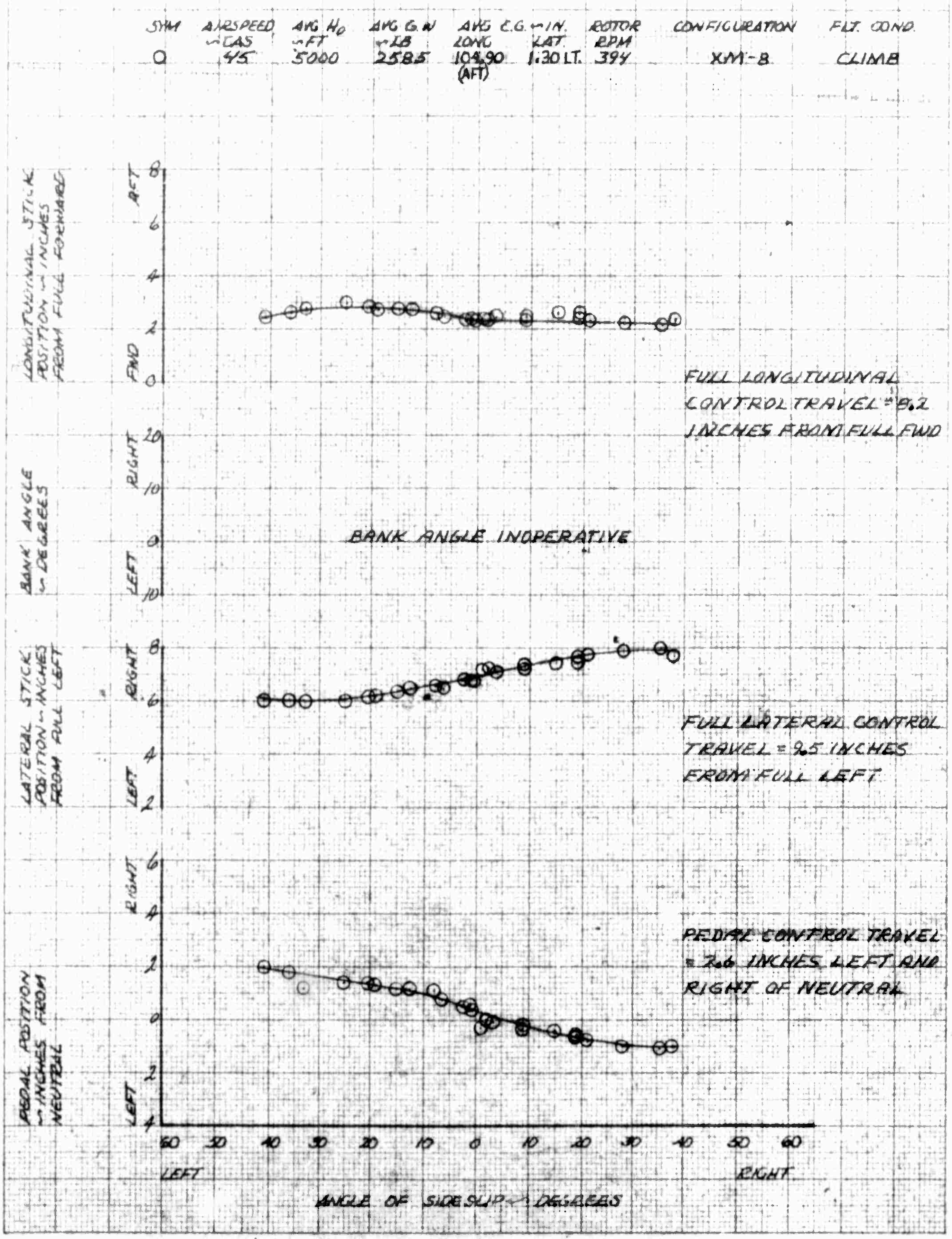


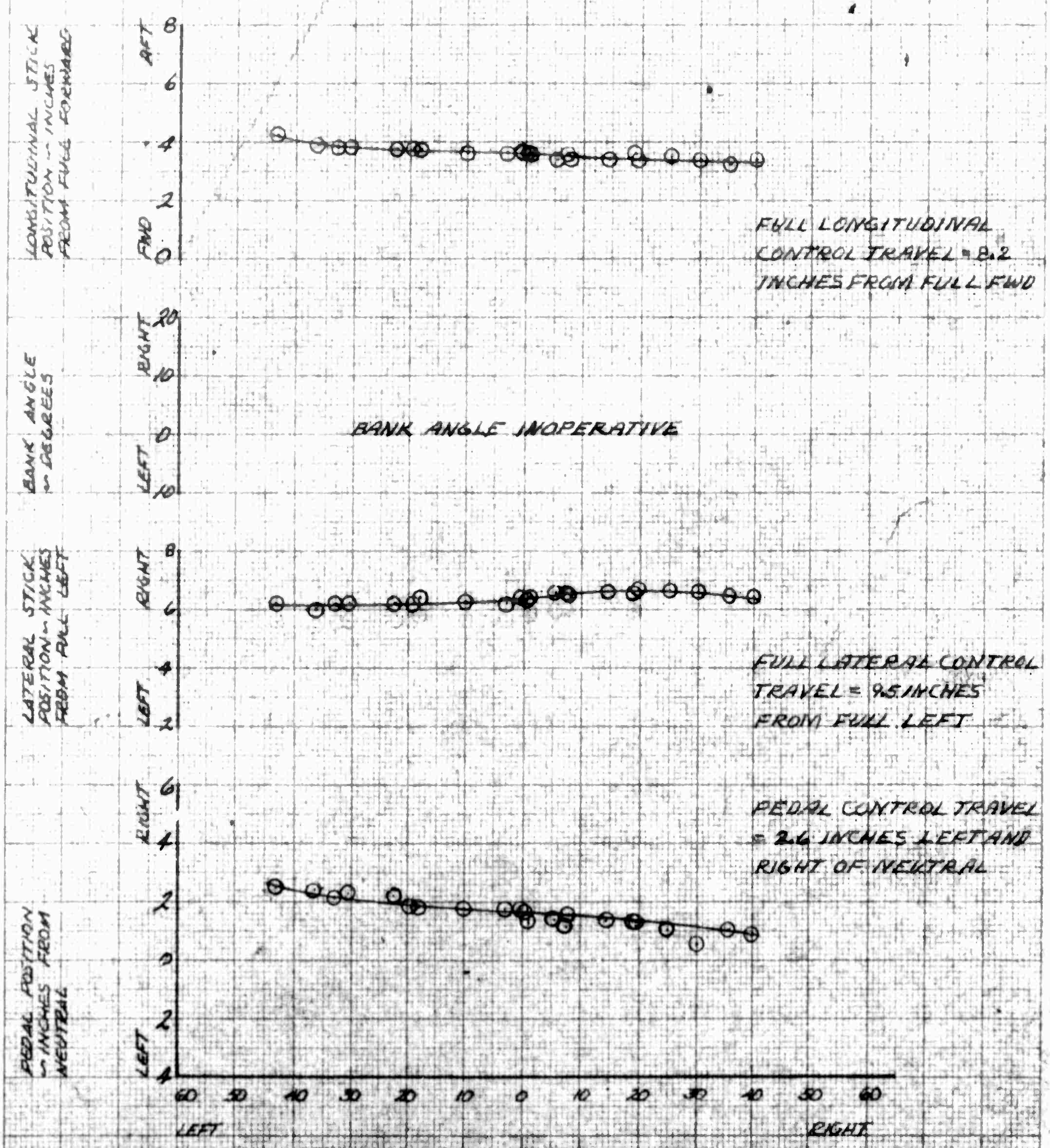
FIGURE No. 40
STATIC LATERAL-DIRECTIONAL STABILITY
OH-4A USA S/N 62-4204



FOR OFFICAL USE ONLY

FIGURE NO. 41
STATIC LATERAL-DIRECTIONAL STABILITY
OH-4A USA S/N 62-4204

SYM	AIRSPEED ~CAS	AVG H_p ~FT	AVG G.W ~LB	AVG C.G. ~IN. LONG	AVG C.G. ~IN. LAT	ROTOR RPM	CONFIGURATION	FLT. COND.
○	45 KTS	5000	2575	104.8 (AFT)	1.30 LT.	410	XM-8	AUTOROTATION



FOR OFFICAL USE ONLY

FIGURE NO. 42

CONTROL POSITIONS IN SIDEWARD FLIGHT

OH-4A USA S/N 62-4204

IN GROUND EFFECT

SYM	AVG H_D ~FT	AVG G.W. ~LB	AVG C.G. ~IN LONG	AVG C.G. ~IN LAT	ROTOR RPM	CONFIGURATION	FLT COND.
○	1670	2585	101.20	.35 RT.	394	CLEAN	SIDEWARD
□	850	2555	100.80 (FWD)	2.77 LT.	394	CLEAN	SIDEWARD

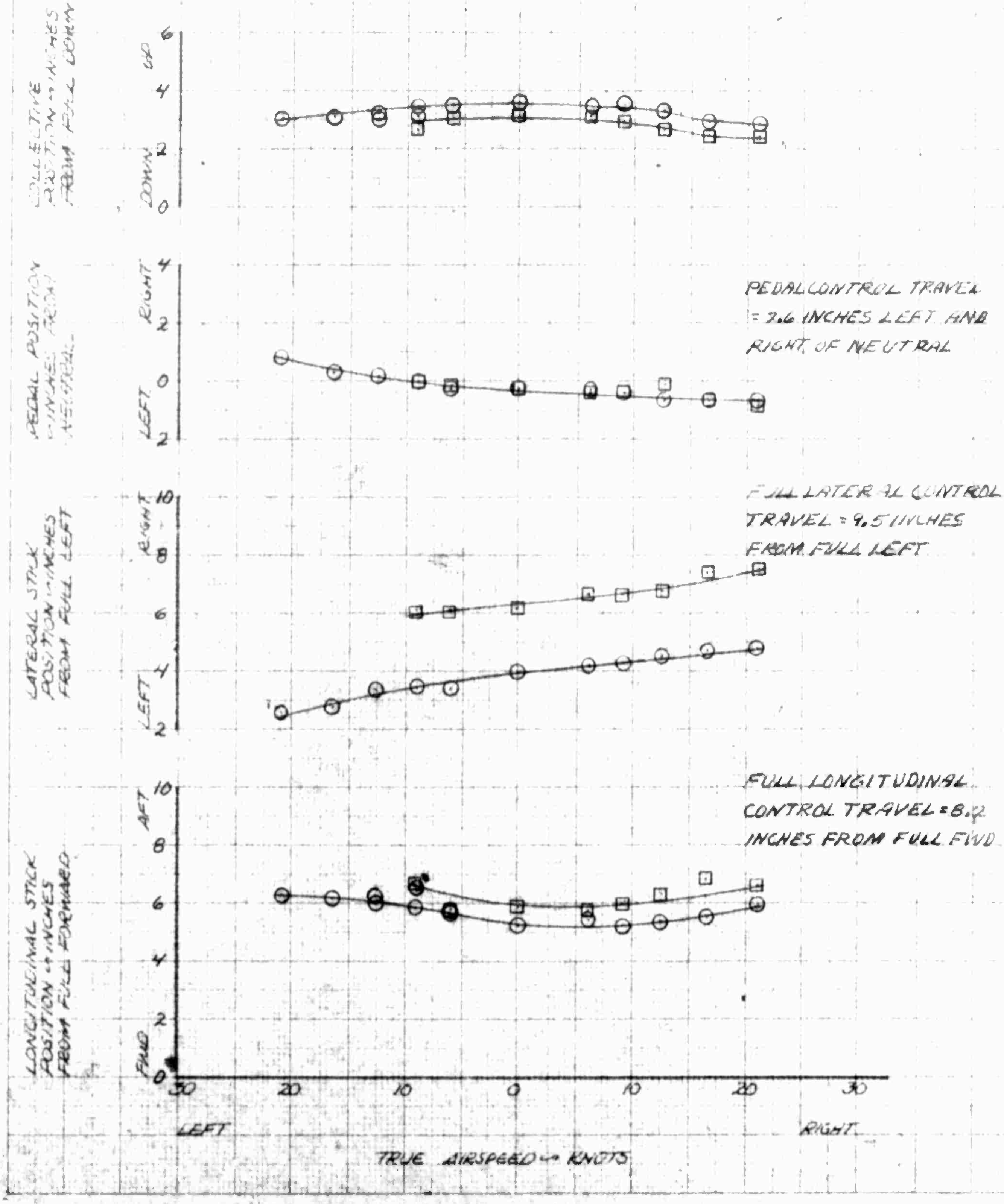


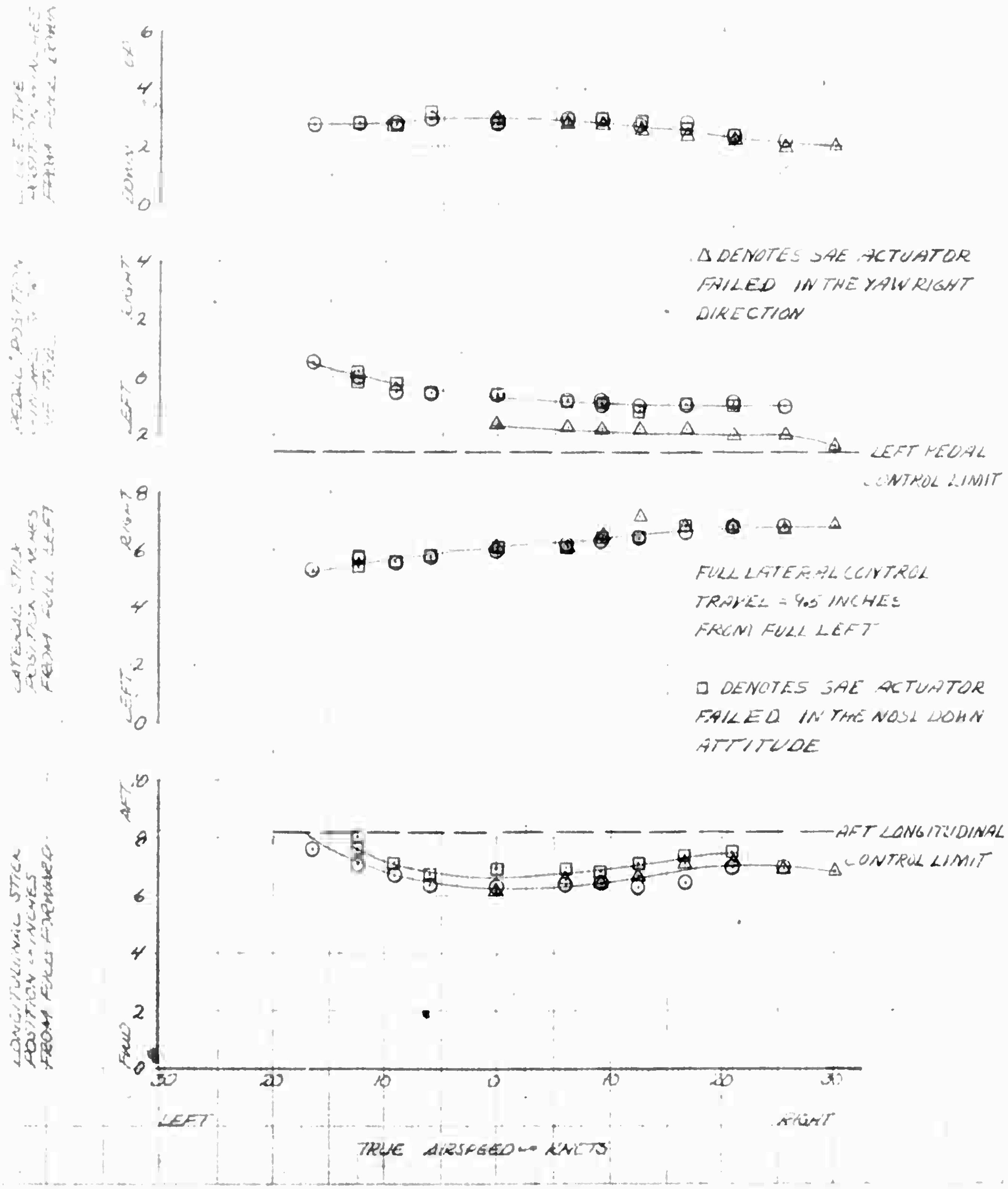
FIGURE NO. 43

CONTROL POSITIONS IN SIDEWARD FLIGHT

OH-4A USA S/N 62-4204

IN GROUND EFFECT

SYM	[illegible] FT	AVG GW LB	AVG CG LONG	LAT	ROTOR RPM	CONFIGURATION		[illegible]
○	1360	2360	99.40	1.18 LT	394	XM-8	SAE OFF	SIDEWARD
□	1360	2345	99.35	1.19 LT	394	XM-8	SAE ON	SIDEWARD
△	1360	2325	99.30 (FWD)	1.19 LT	394	XM-8	SAE ON	SIDEWARD



FOR OFFICAL USE ONLY

FIGURE NO. 44

TIME HISTORY OF SIDEWARD FLIGHT

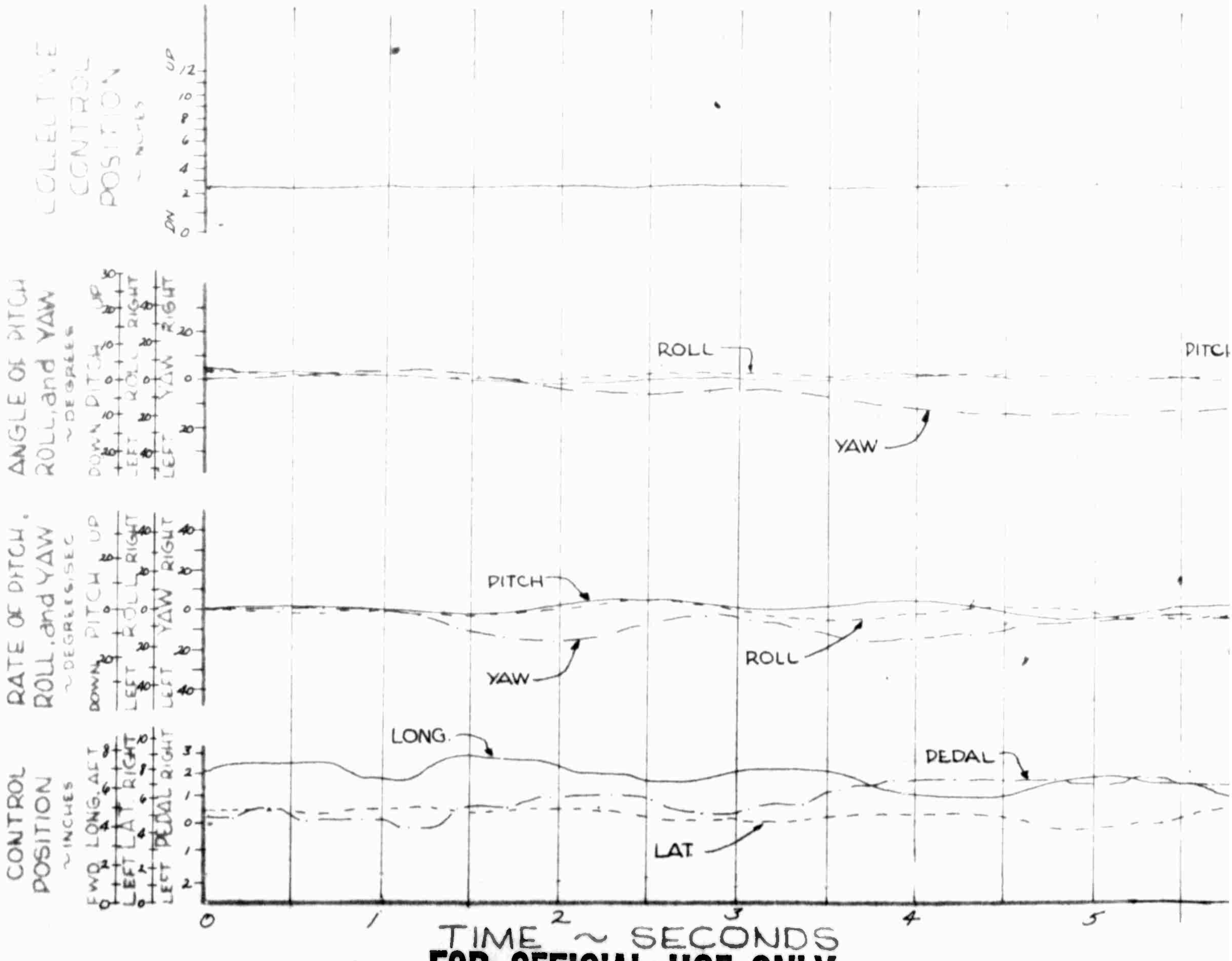
OH-4A, U.S.A., S/N 62-4204

(IN GROUND EFFECT)

CONFIGURATION: XM-8 (SAE-OFF)
AVERAGE GROSS WEIGHT: 2360 LBS
LONG CG LOCATION: 99.40 IN (FWD)
LATERAL CG LOCATION: 1.18 IN (LT)

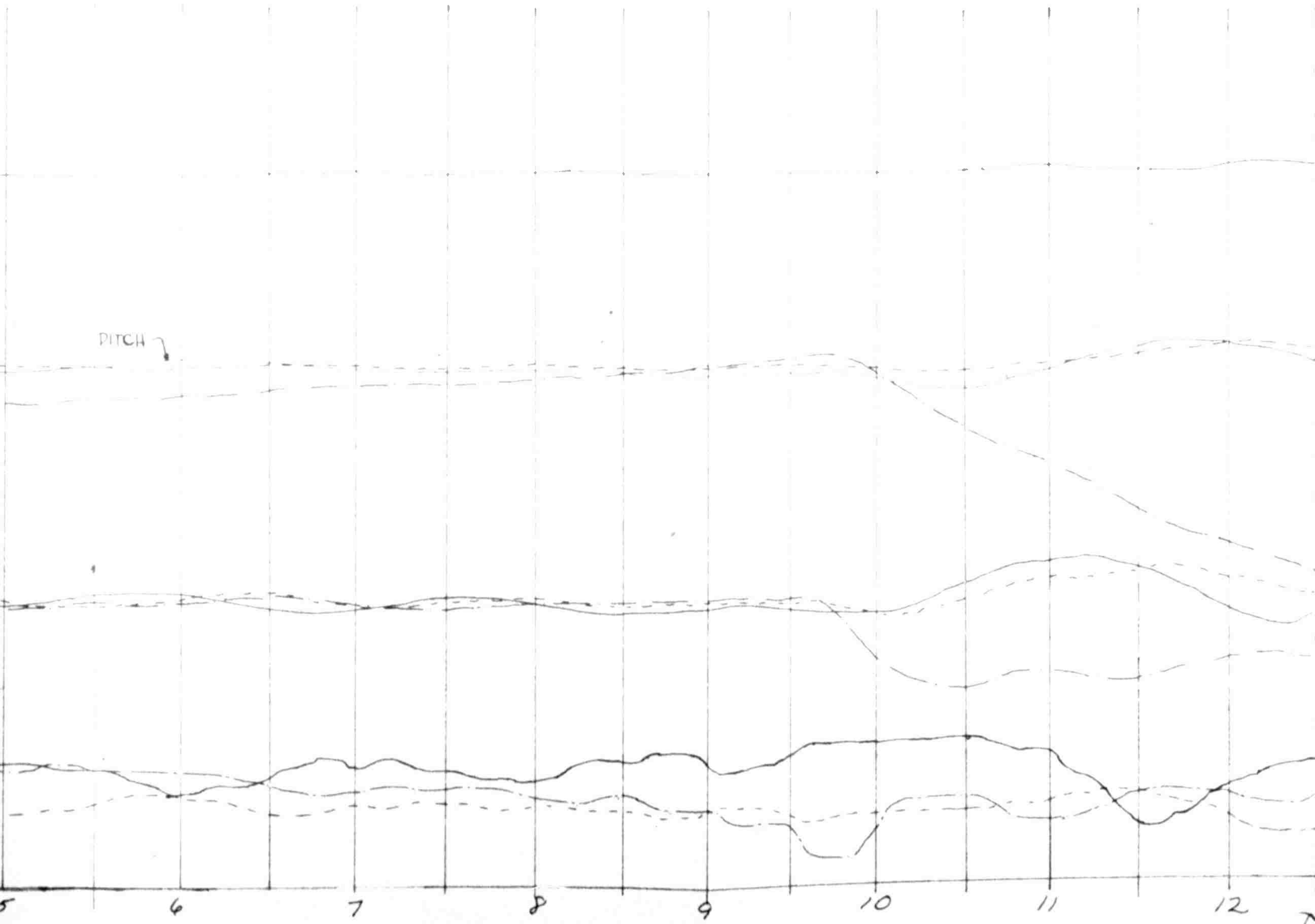
FLIGHT CONDITION: LEFT SIDEWARD FLIGHT
TRIM CAS: APPROX. 10 KNOTS
DENSITY ALTITUDE: 1360 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG STICK
ROLL - - - - and LAT STICK
YAW — - — - and PEDAL



FOR OFFICIAL USE ONLY

D FLIGHT



16

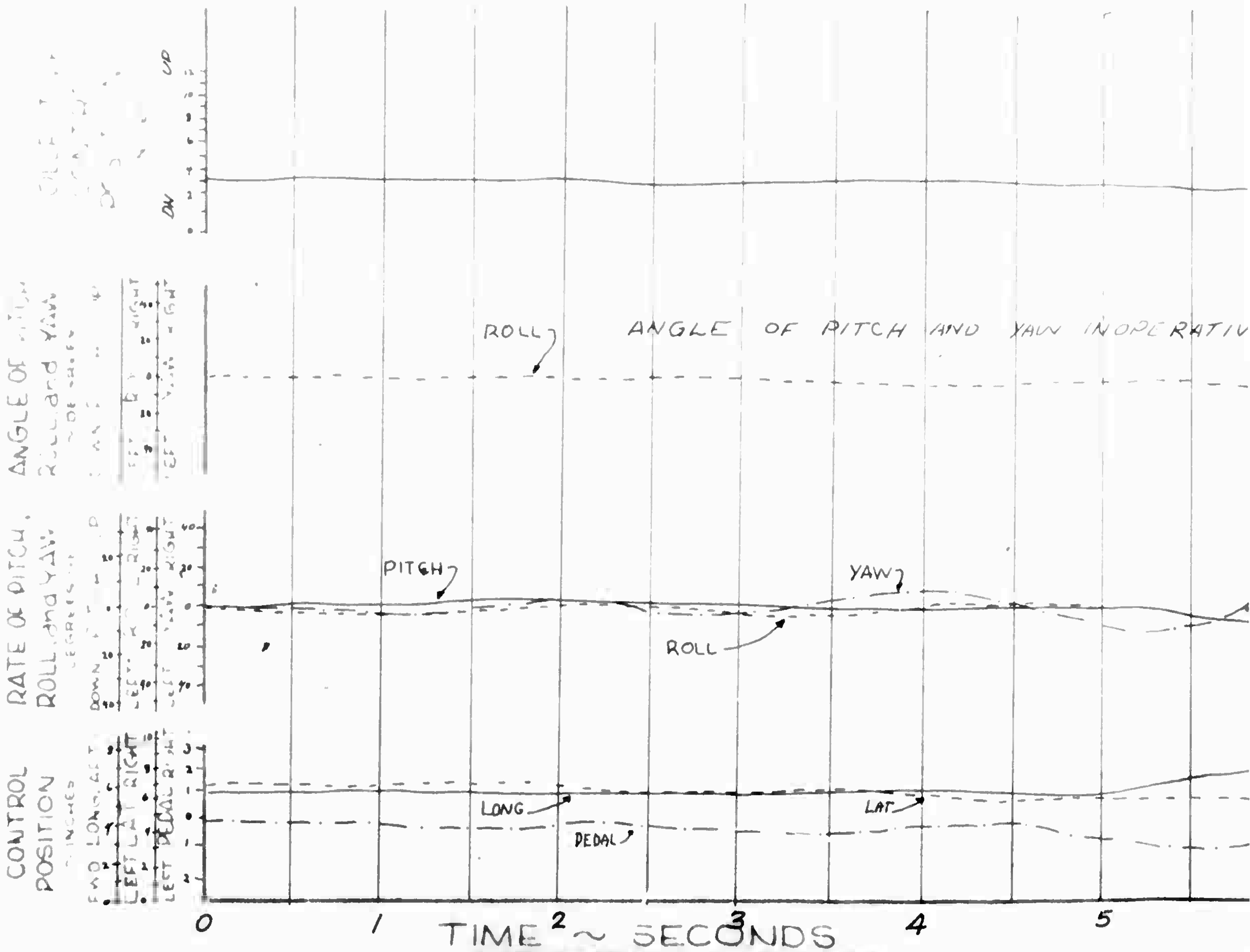
FIGURE NO. 45

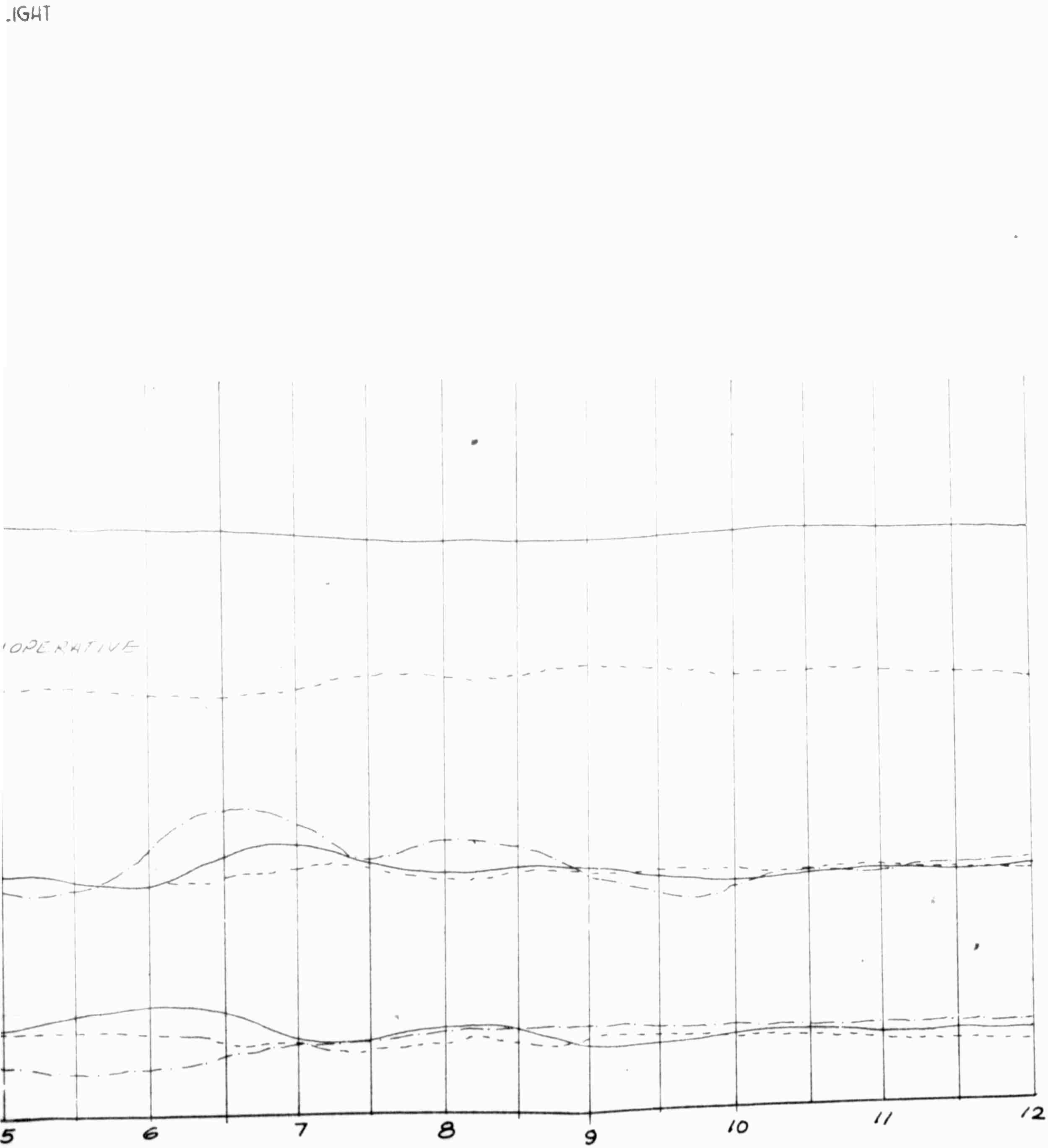
TIME HISTORY OF SIDEWARD FLIGHT

[illegible]-4A, [illegible], S/N 62-[illegible]04
(IN GROUND EFFECT)

CONFIGURATION: CLEAN (SAE-OFF)	FLIGHT CONDITION: LEFT SIDEWARD FLIGHT
AVERAGE GROSS WEIGHT: 2550 LBS.	TRIM CAS: APPROX. 10 KNOTS
LONG. CG LOCATION: 104.70 IN. (AFT)	DENSITY ALTITUDE: 850 FEET
LATERAL CG LOCATION: 2.77 IN. (LT)	ROTOR SPEED: 394 RPM

PITCH ——— and LONG. STICK   ROLL – – – – and LAT. STICK   YAW – · – · – and PEDAL





2

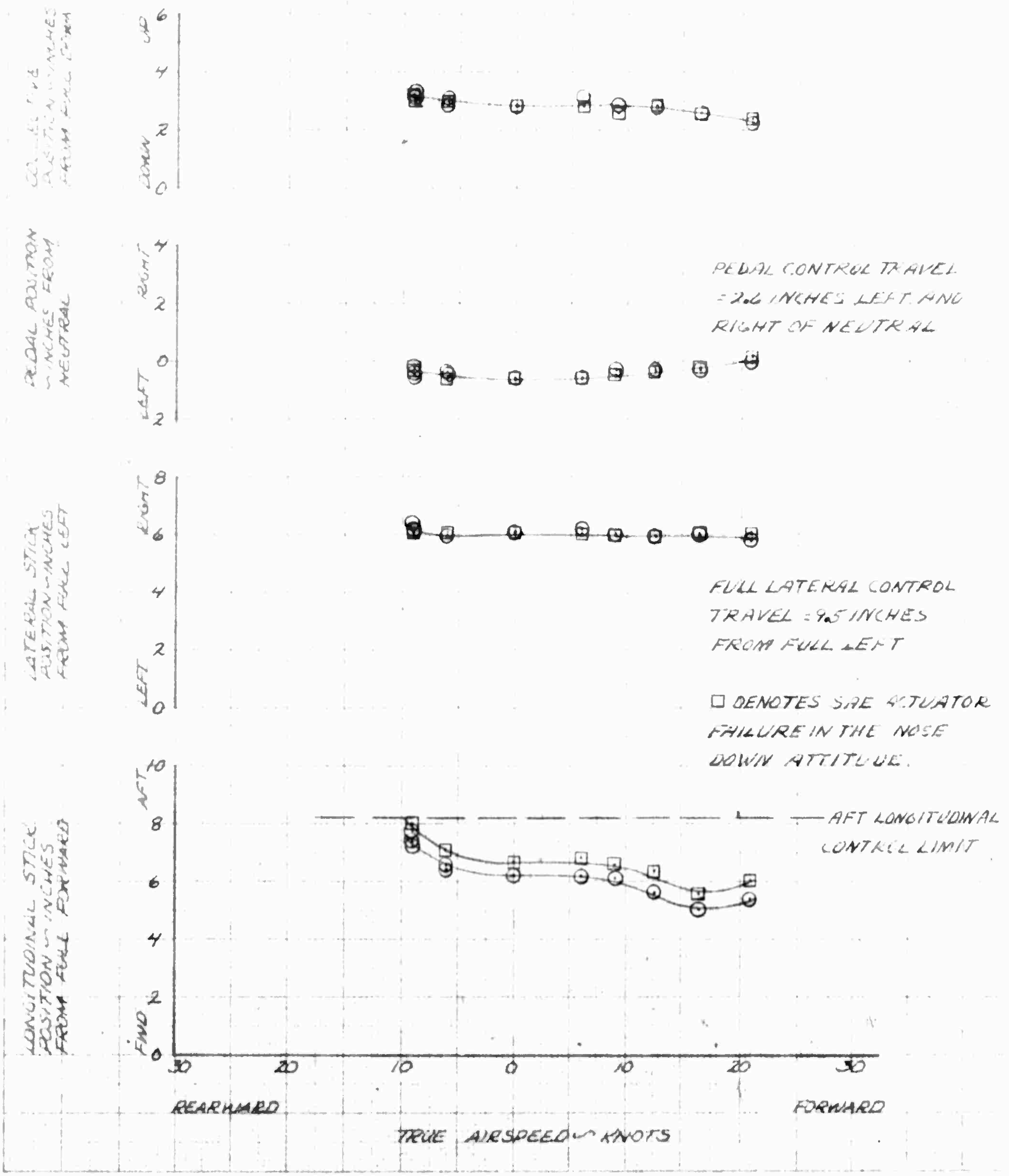
FIGURE NO. [illegible]

CONTROL POSITIONS IN REARWARD FLIGHT

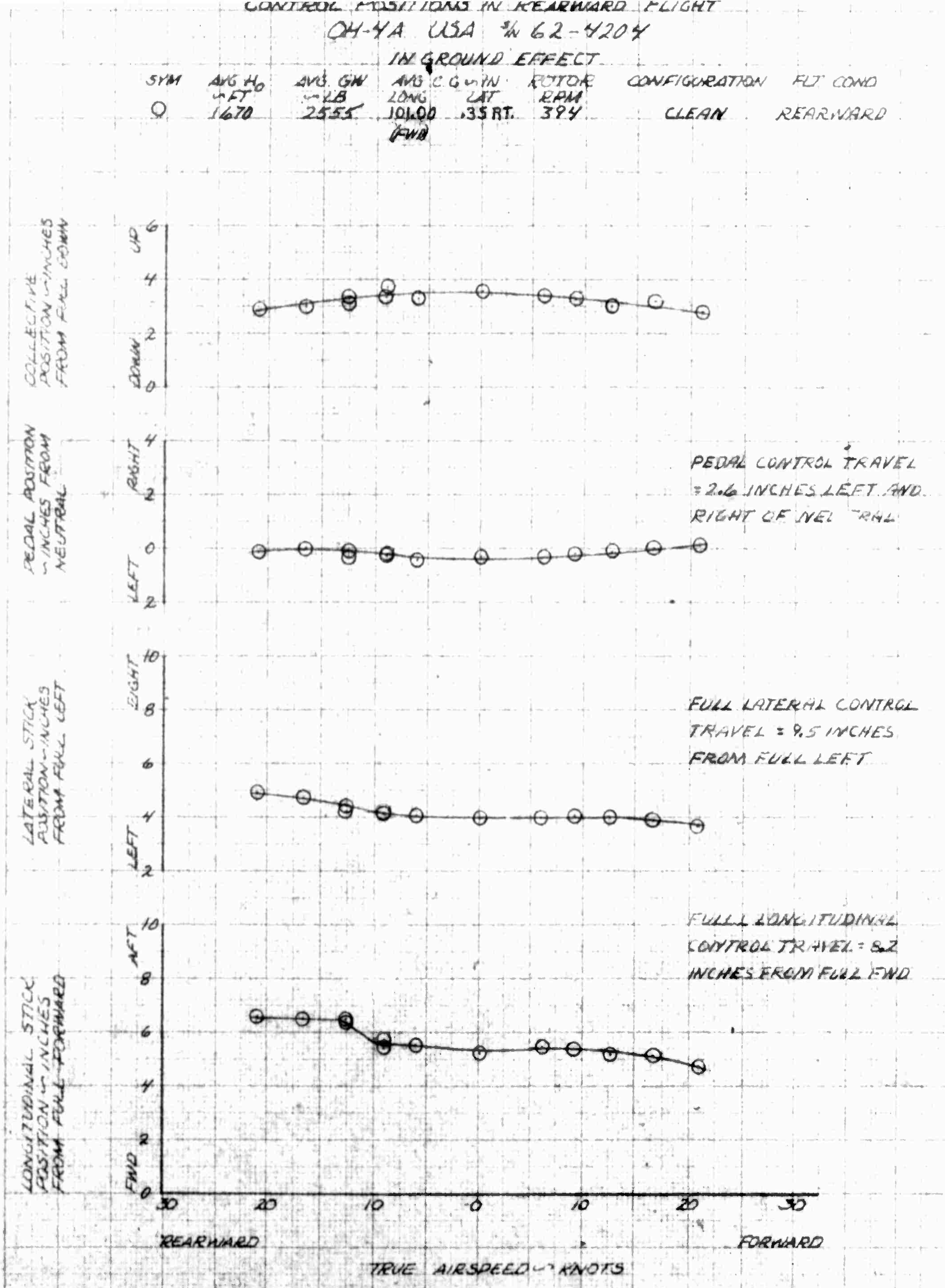
OH-4A USA S/N 62-4204

IN GROUND EFFECT

SYM	AVG H_D ~FT	AVG GW ~LB	AVG CG ~IN LONG	CG ~IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	1360	2395	99.50	1.16 LT	394	XM-8 SAS OFF	REARWARD
□	1360	2388	99.45 (FWD)	1.17 LT	394	XM-8 SAS ON	REARWARD



FOR OFFICAL USE ONLY



FOR OFFICAL USE ONLY

TIME HISTORY OF REARWARD FLIGHT

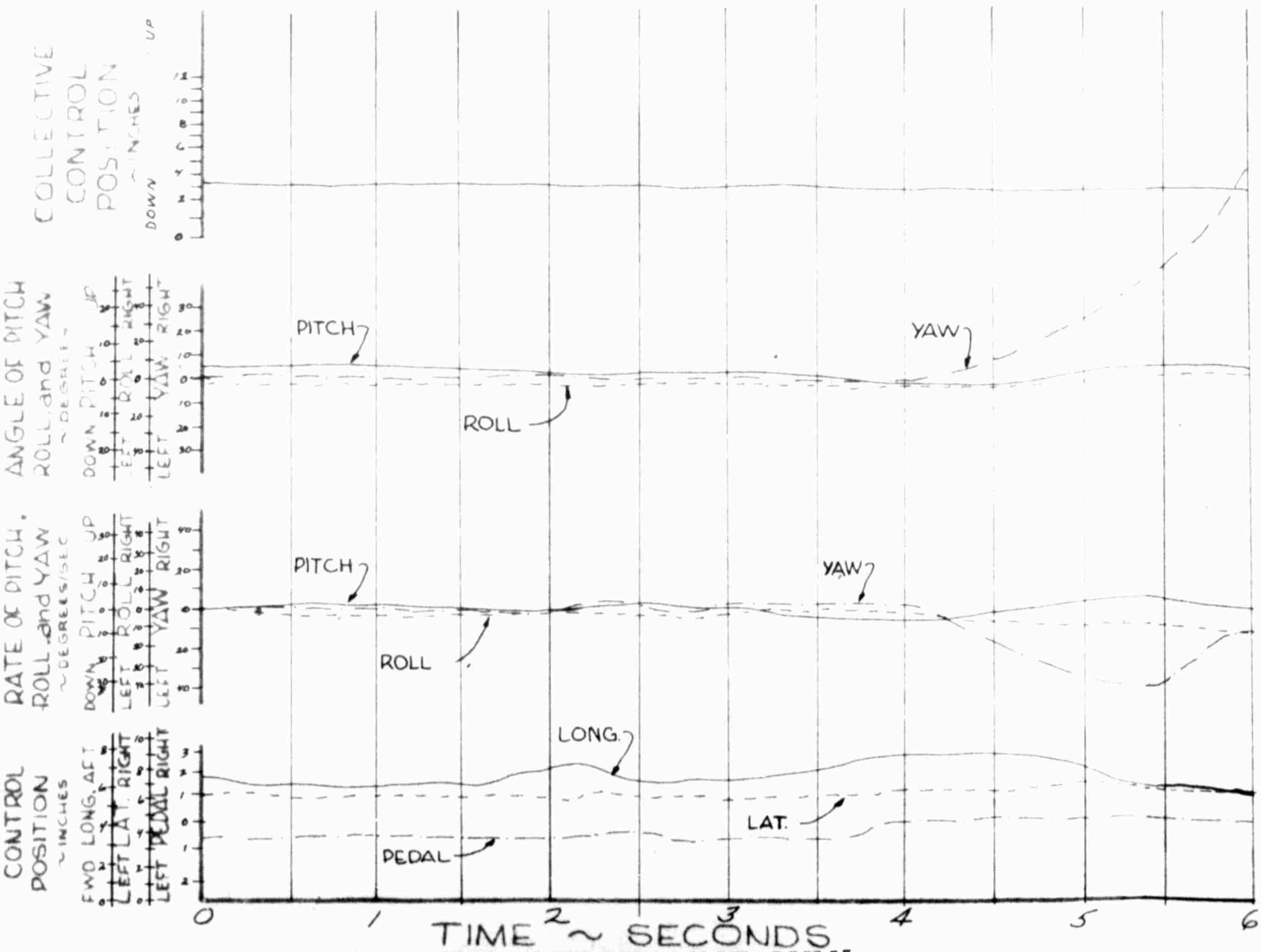
OH-4A, U.S.A., S/N 62-4204

(IN GROUND EFFECT)

CONFIGURATION: XM-8 (SAE-OFF)
AVERAGE GROSS WEIGHT: 2390 LBS
LONG CG LOCATION: 99.5 IN (FWD)
LATERAL CG LOCATION: 1.16 IN (LT)

FLIGHT CONDITION: REARWARD FLIGHT
TRIM CAS: APPROX. 10 KNOTS
DENSITY ALTITUDE: 1360 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG STICK   ROLL – – – – and LAT STICK   YAW — - — - and PEDAL



FOR OFFICIAL USE ONLY

CH-4A, U.S.A., S/N 62-4204

CONFIGURATION: CLEAN

FULL LONGITUDINAL TRAVEL: 8.2 INCHES

AVERAGE GROSS WEIGHT: 2615 LBS

LONG. C.G. LOCATION: 105.7 IN (AFT)

LATERAL C.G. LOCATION: .35 IN (RT)

FLIGHT CONDITION: HOVER(IGE)

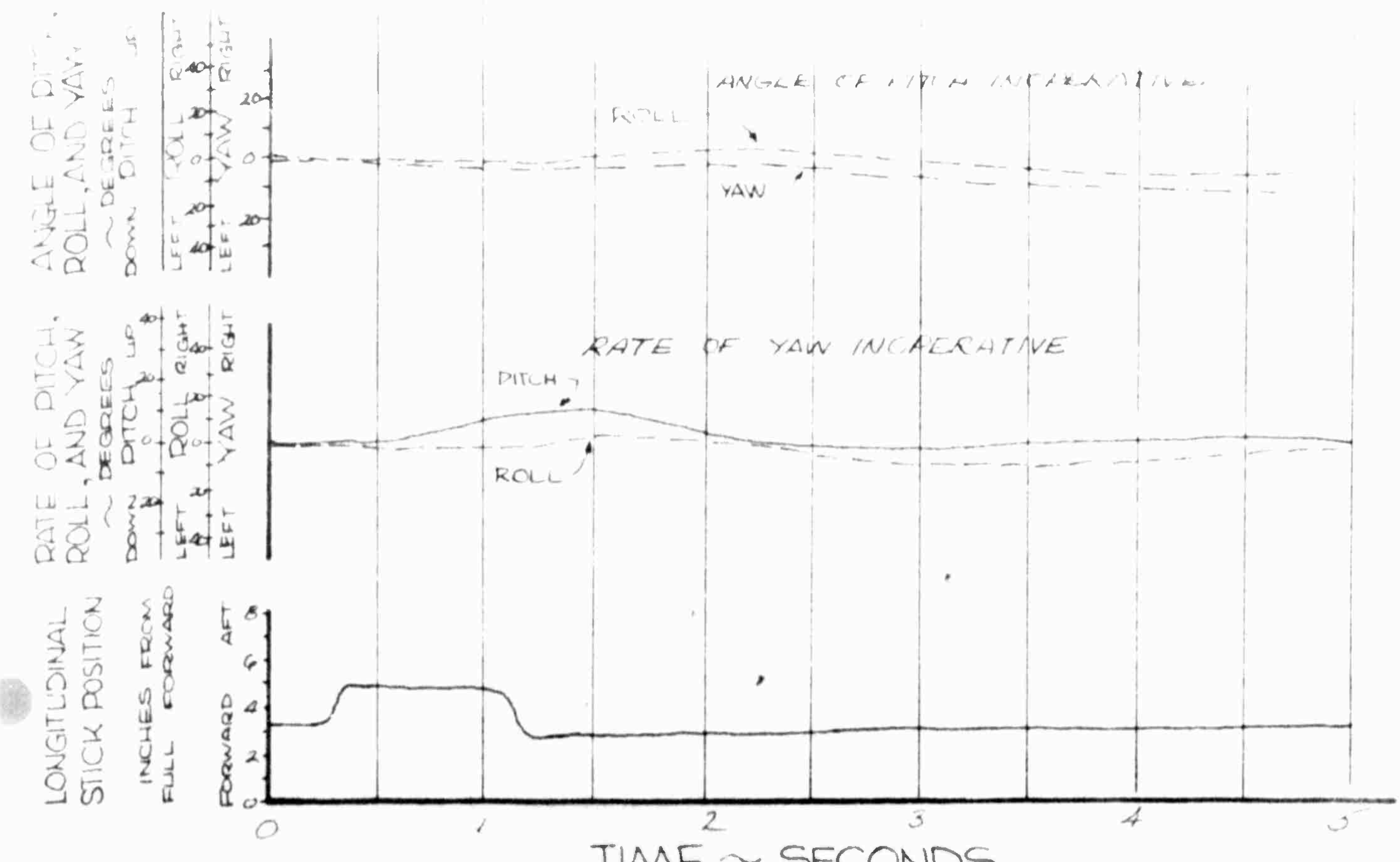
TRIM CAS: ZERO

DENSITY ALTITUDE: 780 FEET

ROTOR SPEED: 3[illegible] RPM

SAE CONDITION: OFF

PITCH ———— ROLL - - - - YAW — - — -



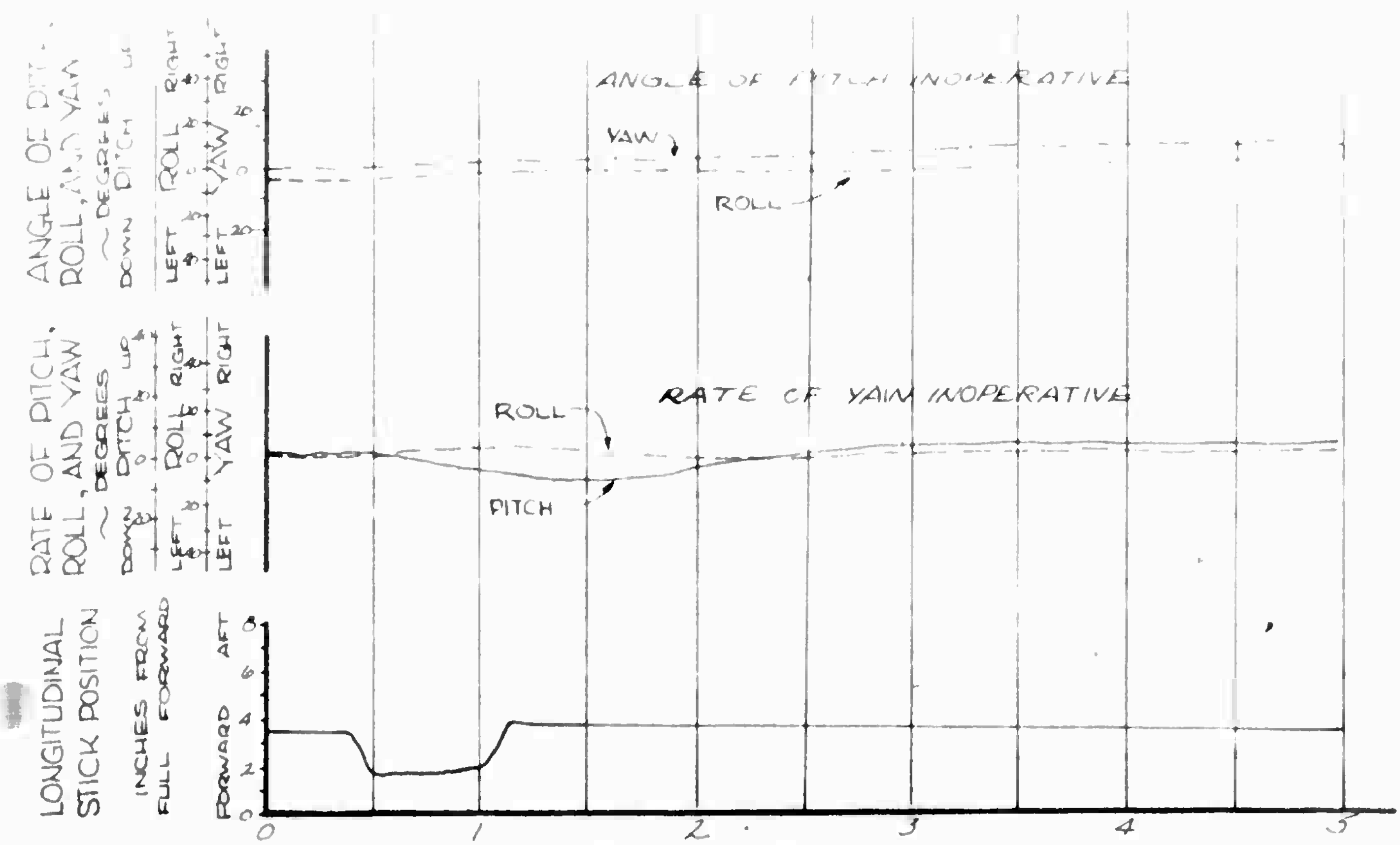
FOR OFFICAL USE ONLY

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: CLEAN
FULL LONGITUDINAL TRAVEL: 8.2 INCHES
AVERAGE GROSS WEIGHT: 2615 LBS
LONG. C.G. LOCATION: 105.7 IN (AFT)
LATERAL C.G. LOCATION: .35 IN (RT)

FLIGHT CONDITION: HOVER (IGE)
TRIM CAS: ZERO
DENSITY ALTITUDE: 780 FEET
ROTOR SPEED: 394 RPM
SAS CONDITION: OFF

PITCH ——— ROLL - - - - YAW — — —

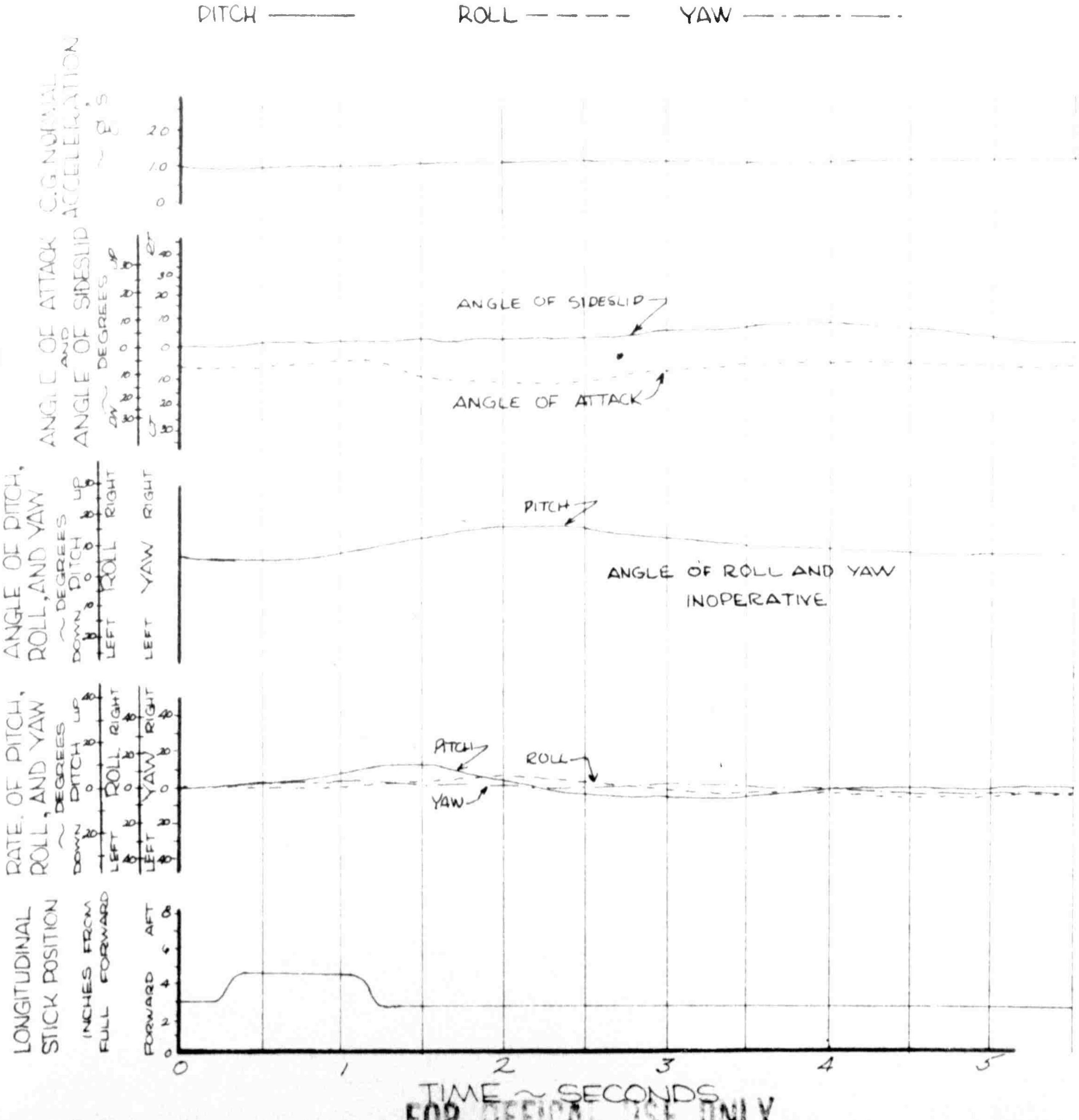


FOR OFFICIAL USE ONLY

OH-4A, U.S.A., S/N 62-4204

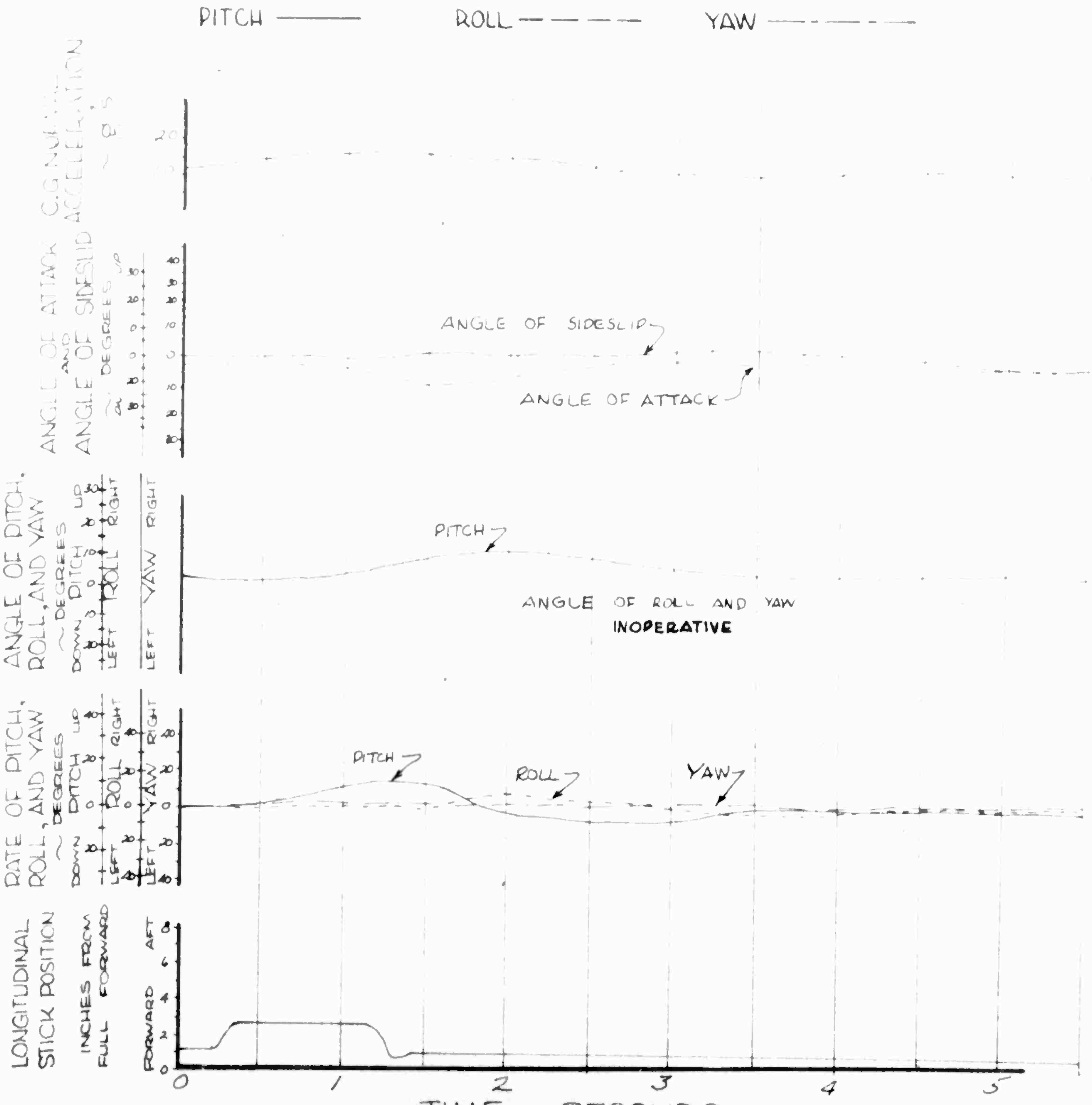
CONFIGURATION: CLEAN
FULL LONGITUDINAL TRAVEL: 8.2 INCHES
AVERAGE GROSS WEIGHT: 2530 LBS
LONG. C.G. LOCATION: 105.4 IN. (AFT)
LATERAL C.G. LOCATION: .35 IN. (RT)

FLIGHT CONDITION: LEVEL FLIGHT
TRIM CAS: 35 KNOTS
DENSITY ALTITUDE: 4650 FEET
ROTOR SPEED: 394 RPM
SAS CONDITION: OFF



CONFIGURATION: CLEAN
FULL LONGITUDINAL TRAVEL: 8.2 INCHES
AVERAGE GROSS WEIGHT: 2530 LBS.
LONG. C.G. LOCATION: 105.4 IN. (AFT)
LATERAL C.G. LOCATION: .35 IN (RT.)

FLIGHT CONDITION: LEVEL FLIGHT
TRIM CAS: 99 KNOTS
DENSITY ALTITUDE: 4650 FEET
ROTOR SPEED: 394 RPM
SAS CONDITION: OFF



CONFIGURATION: CLEAN | FLIGHT CONDITION: LEVEL FLIGHT
FULL LONGITUDINAL TRAVEL: 8.2 INCHES | TRIM CAS: 102 KNOTS
AVERAGE GROSS WEIGHT: 2610 LBS | DENSITY ALTITUDE: 4980 FEET
LONG C.G. LOCATION: 100.5 IN (FWD) | ROTOR SPEED: 394 RPM
LATERAL C.G LOCATION: .35 IN (RT) | SAE CONDITION: OFF

PITCH ——— ROLL - - - - - YAW - - - - -

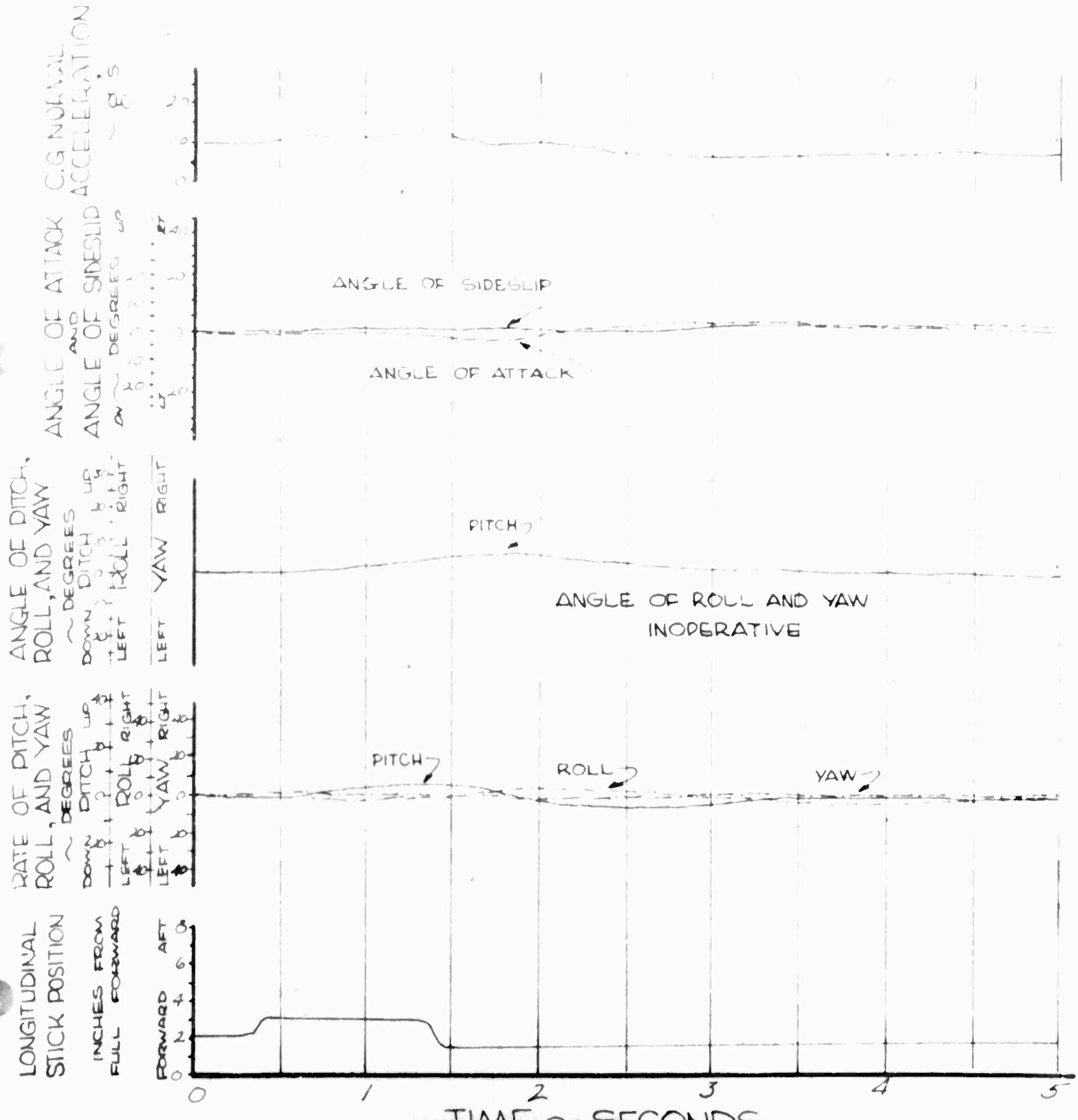


FIGURE NO. 54

AFT LONGITUDINAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: CLEAN
FULL LONGITUDINAL TRAVEL: 8.2 INCHES
AVERAGE GROSS WEIGHT: 2820 LBS.
LONG. C.G. LOCATION: 104.7 IN (AFT)
LATERAL C.G. LOCATION: .75 IN (LT)

FLIGHT CONDITION: LEVEL FLIGHT
TRIM CAS: 92 KNOTS
DENSITY ALTITUDE: 5410 FEET
ROTOR SPEED: 394 RPM
SAS CONDITION: OFF

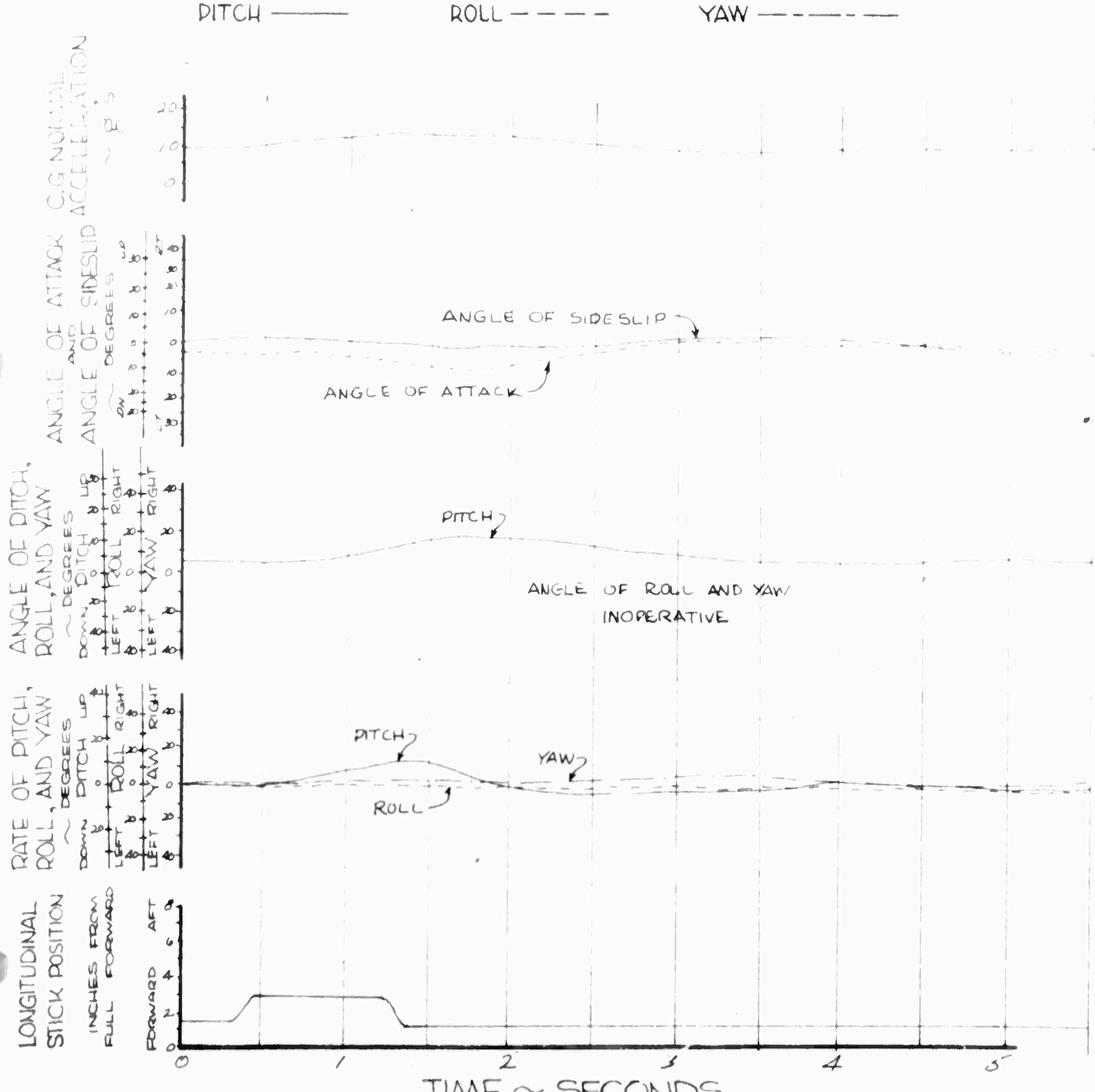


FIGURE NO. 55

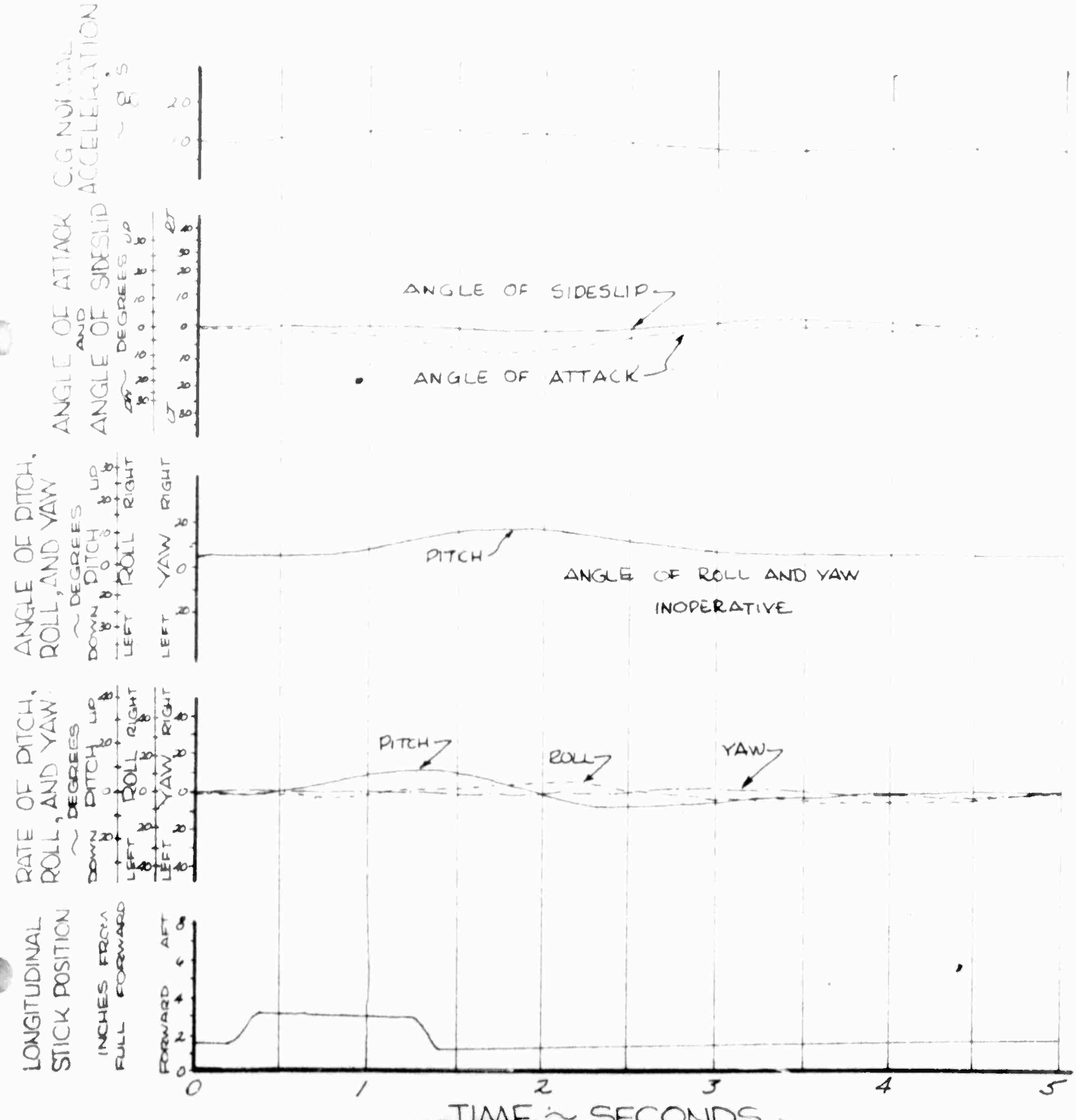
AFT LONGITUDINAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: CLEAN
FULL LONGITUDINAL TRAVEL: 8.2 INCHES
AVERAGE GROSS WEIGHT: 2515 LBS
LONG. C.G. LOCATION: 105.2 IN. (AFT)
LATERAL C.G. LOCATION: .35 IN. (RT)

FLIGHT CONDITION: LEVEL FLIGHT
TRIM CAS: 86 KNOTS
DENSITY ALTITUDE: 10300 FEET
ROTOR SPEED: 394 RPM
SAS CONDITION: OFF

PITCH ———— ROLL - - - - YAW —·—·—·



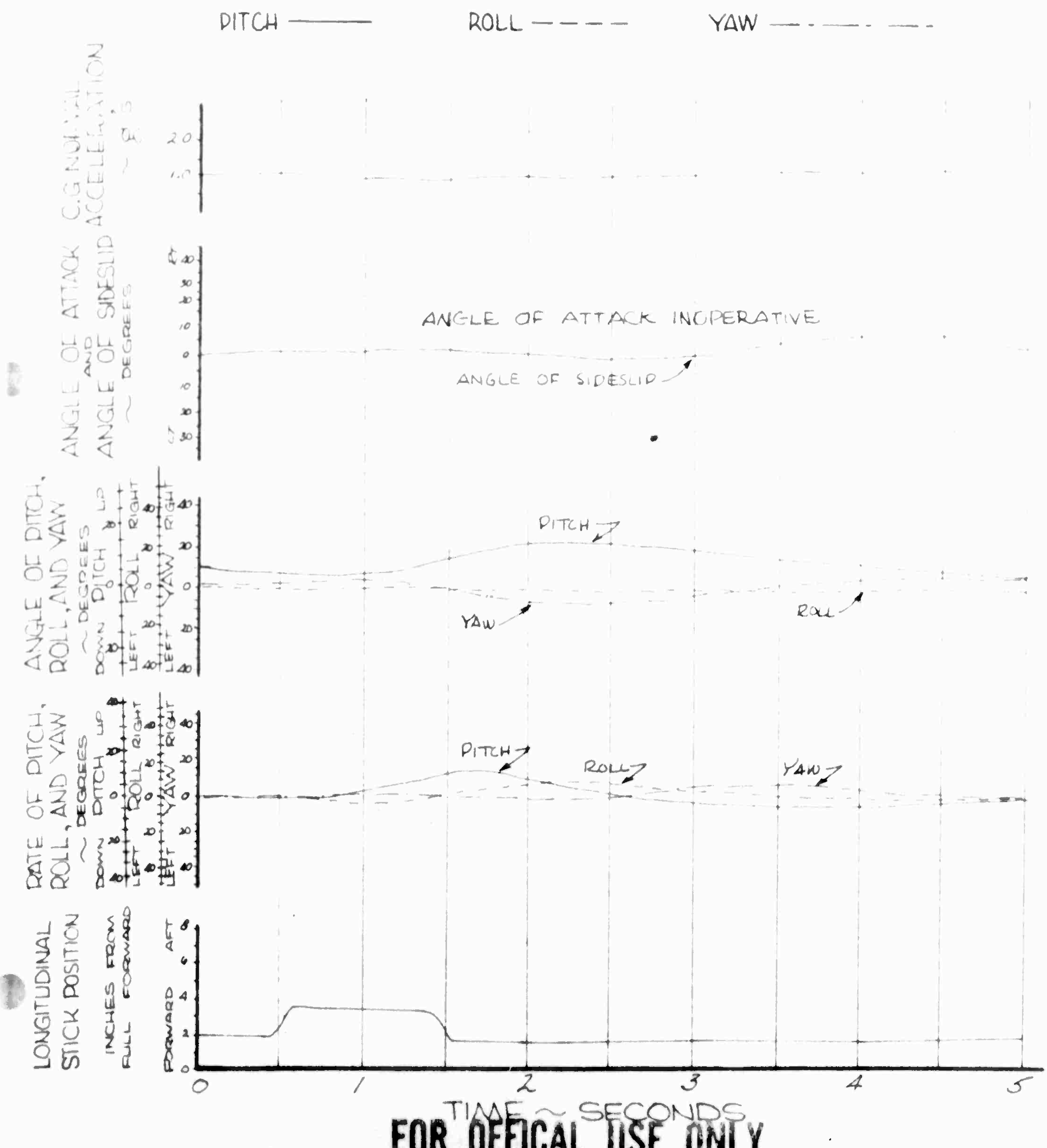
FOR OFFICAL USE ONLY

FIGURE NO. 56

AFT LONGITUDINAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: CLEAN	FLIGHT CONDITION: CLIMB
FULL LONGITUDINAL TRAVEL: 8.2 INCHES	TRIM CAS: 45 KNOTS
AVERAGE GROSS WEIGHT: 2615 LBS.	DENSITY ALTITUDE: 5000 FEET
LONG. C.G. LOCATION: 105.8 IN. (AFT)	ROTOR SPEED: 394 RPM
LATERAL C.G. LOCATION: .35 IN (RT)	SAS CONDITION: OFF



FOR OFFICAL USE ONLY

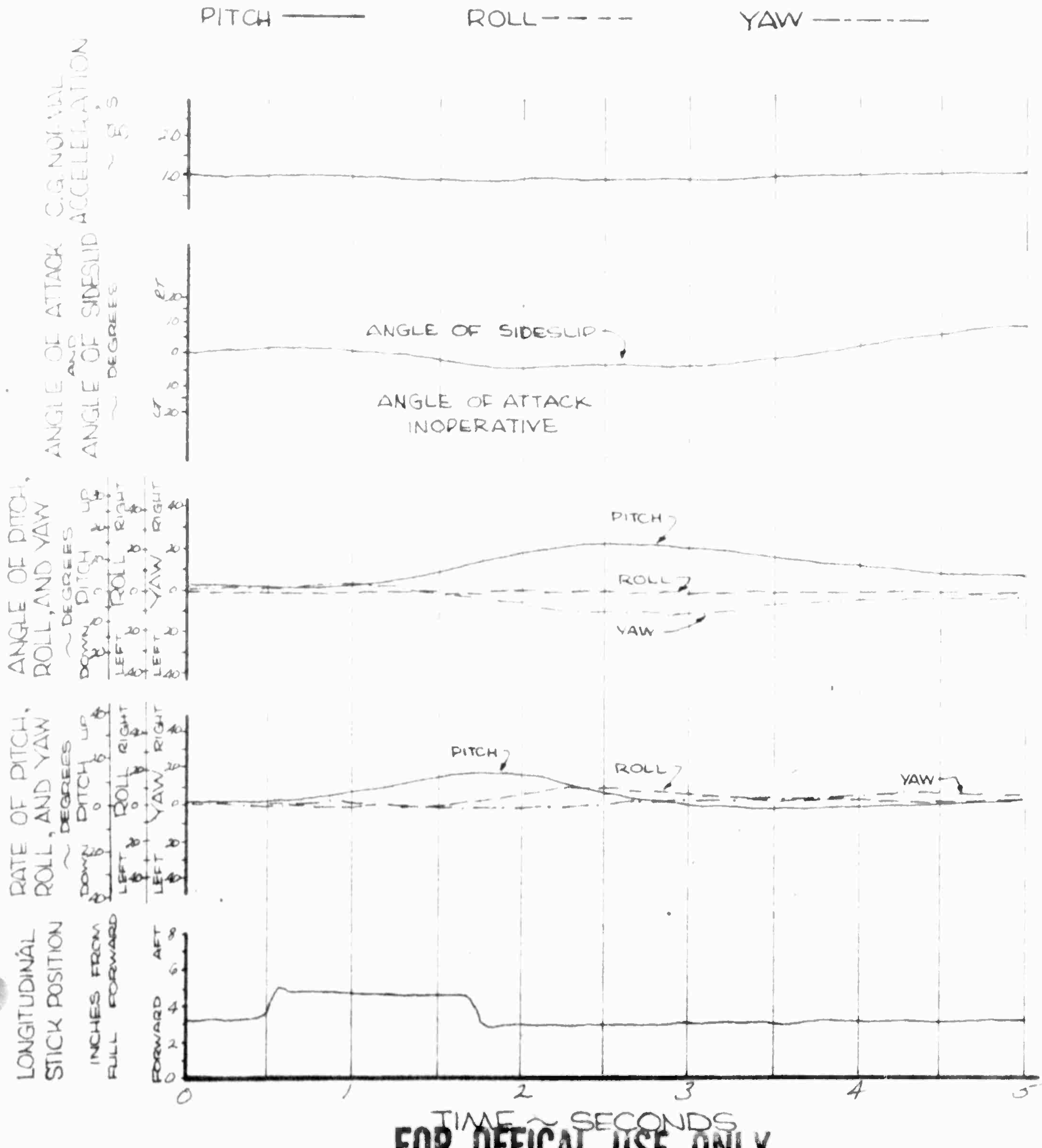
FIGURE. NO. 57

AFT LONGITUDINAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: CLEAN
FULL LONGITUDINAL TRAVEL: 8.2 INCHES
AVERAGE GROSS WEIGHT: 2575 LBS.
LONG. C.G. LOCATION: 105.6 IN (AFT)
LATERAL C.G. LOCATION: .35 IN. (RT)

FLIGHT CONDITION: AUTOROTATION
TRIM CAS: 45 KNOTS
DENSITY ALTITUDE: 5000 FEET
ROTOR SPEED: 394 RPM
SAE CONDITION: OFF



FOR OFFICAL USE ONLY

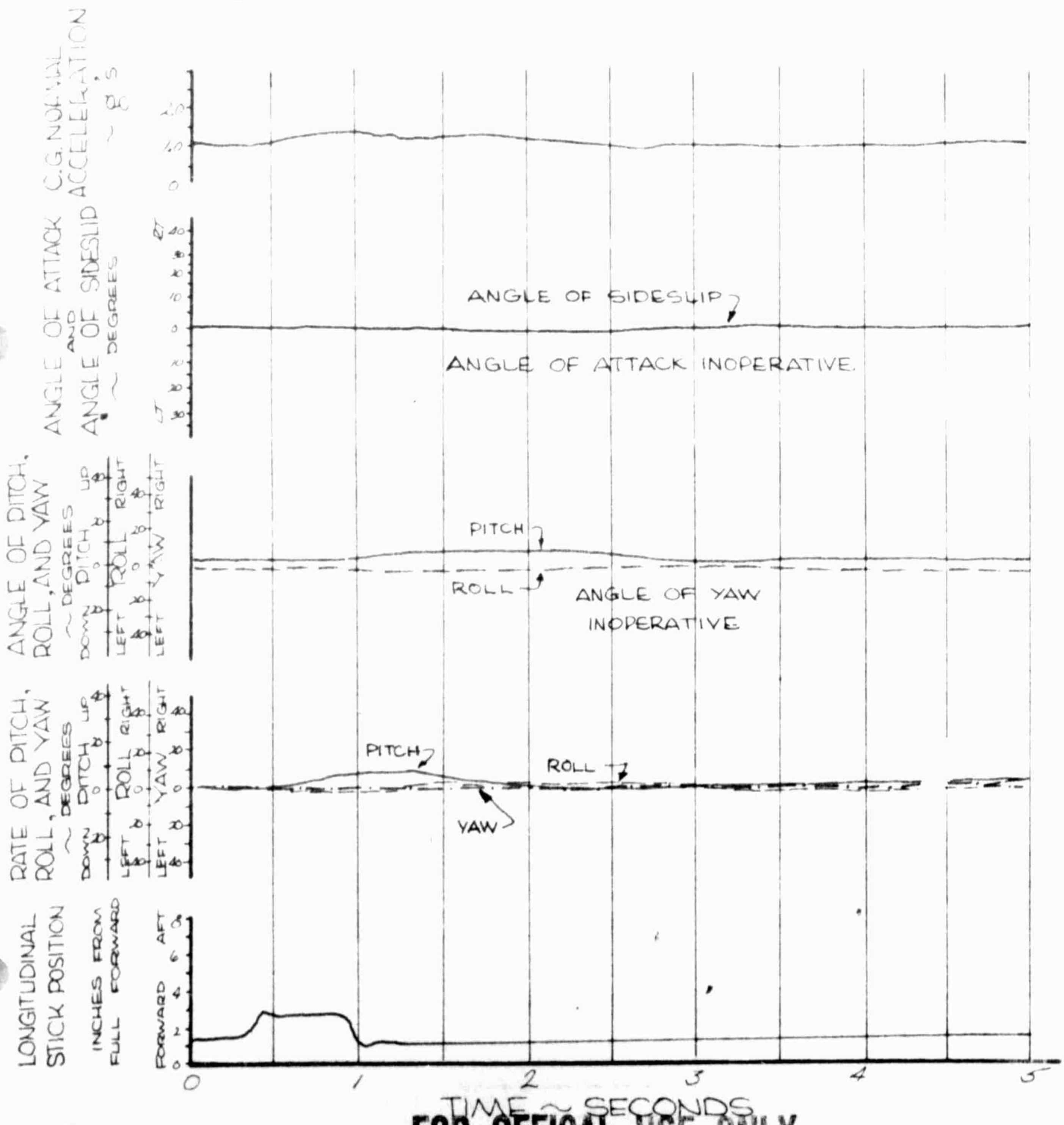
FIGURE NO. 58

AFT LONGITUDINAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-7 STOWED | FLIGHT CONDITION: LEVEL FLIGHT
FULL LONGITUDINAL TRAVEL: 8.2 INCHES | TRIM CAS: 98 KNOTS
AVERAGE GROSS WEIGHT: 2650 LBS. | DENSITY ALTITUDE: 3890 FEET
LONG. C.G. LOCATION: 104.9 IN (AFT) | ROTOR SPEED: 394 RPM
LATERAL C.G. LOCATION: 1.25 IN (LT) | SAE CONDITION: OFF

PITCH ———— ROLL - - - - YAW —·—·—



FOR OFFICAL USE ONLY

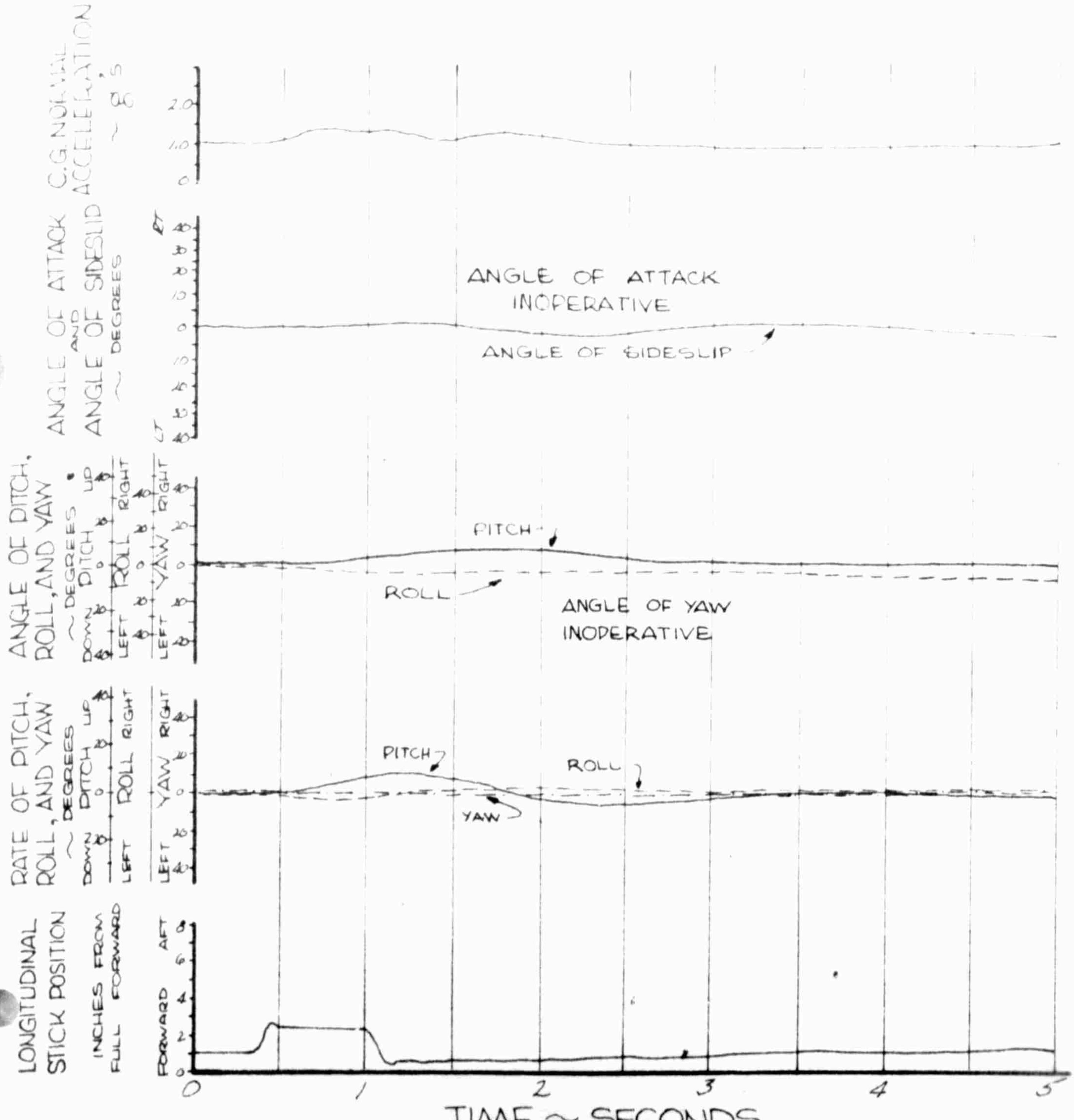
FIGURE NO. 59

AFT LONGITUDINAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-/ STOWED	FLIGHT CONDITION: LEVEL FLIGHT
FULL LONGITUDINAL TRAVEL: 8.2 INCHES	TRIM CAS: 98 KNOTS
AVERAGE GROSS WEIGHT: 2510 LBS	DENSITY ALTITUDE: 5080 FEET
LONG C.G. LOCATION: 104.4 IN (AFT)	ROTOR SPEED: 394 RPM
LATERAL C.G. LOCATION: 1.25 IN (LT)	SAE CONDITION: ON

PITCH ——— ROLL - - - - YAW —·—·—



FOR OFFICAL USE ONLY

AFT LONGITUDINAL PULSE

FIGURE NO. 61

AFT LONGITUDINAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-8 STOWED
FULL LONGITUDINAL TRAVEL: 8.2 INCHES
AVERAGE GROSS WEIGHT: 2505 LBS
LONG. C.G. LOCATION: 104.9 IN (AFT)
LATERAL C.G. LOCATION: 1.30 IN (LT)

FLIGHT CONDITION: LEVEL FLIGHT
TRIM CAS: 98 KNOTS
DENSITY ALTITUDE: 5140 FEET
ROTOR SPEED: 394 RPM
SAE CONDITION: ON

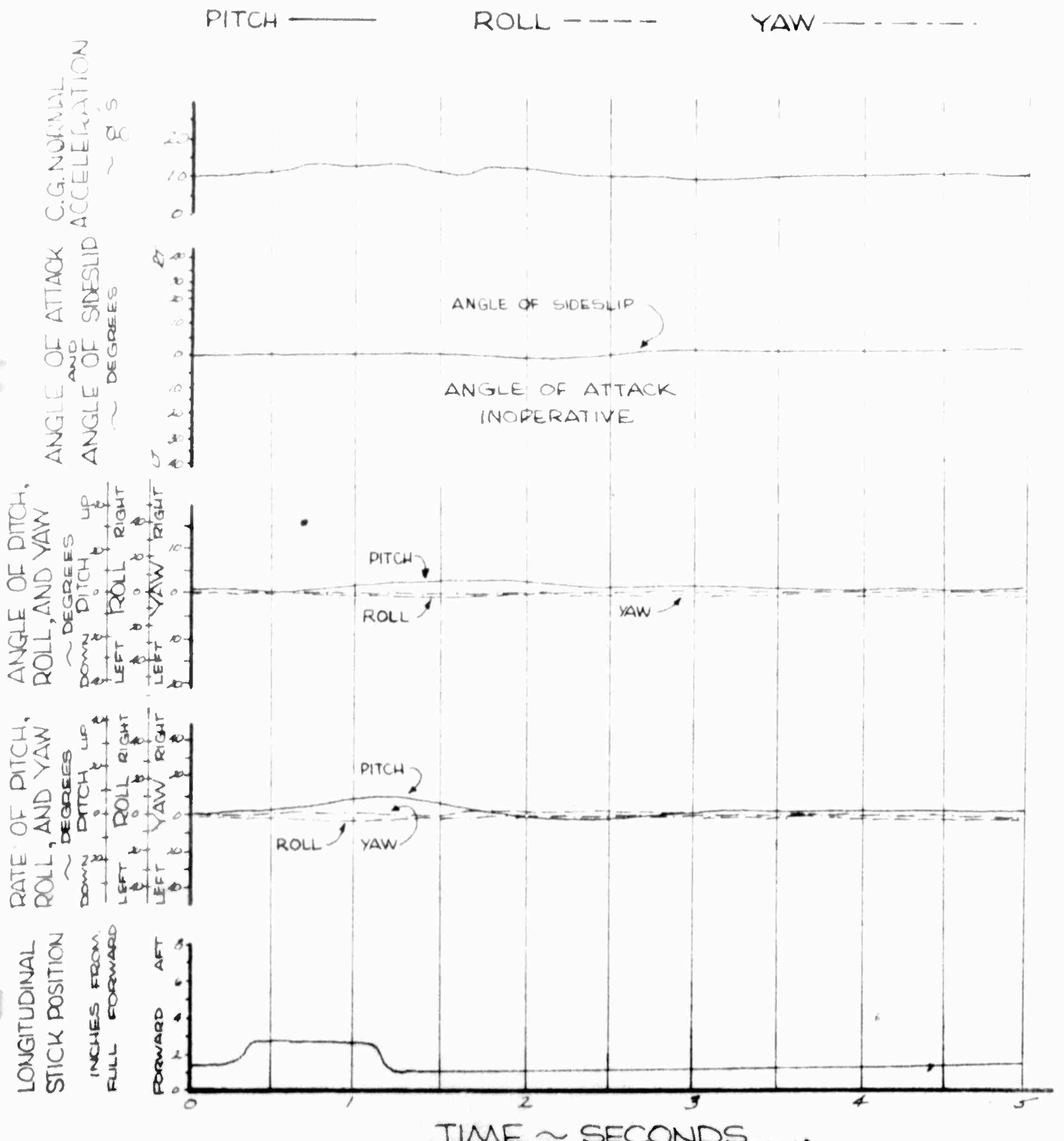


FIGURE NO. 62

LEFT LATERAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: CLEAN
FULL LATERAL TRAVEL: 9.5 INCHES
AVERAGE GROSS WEIGHT: 2570 LBS
LONG. C.G. LOCATION: 105.5 IN (AFT)
LATERAL C.G. LOCATION: .35 IN. (RT)

FLIGHT CONDITION: HOVER (IGE)
TRIM CAS: ZERO
DENSITY ALTITUDE: 780 FEET
ROTOR SPEED: 394 RPM
SAE CONDITION: OFF

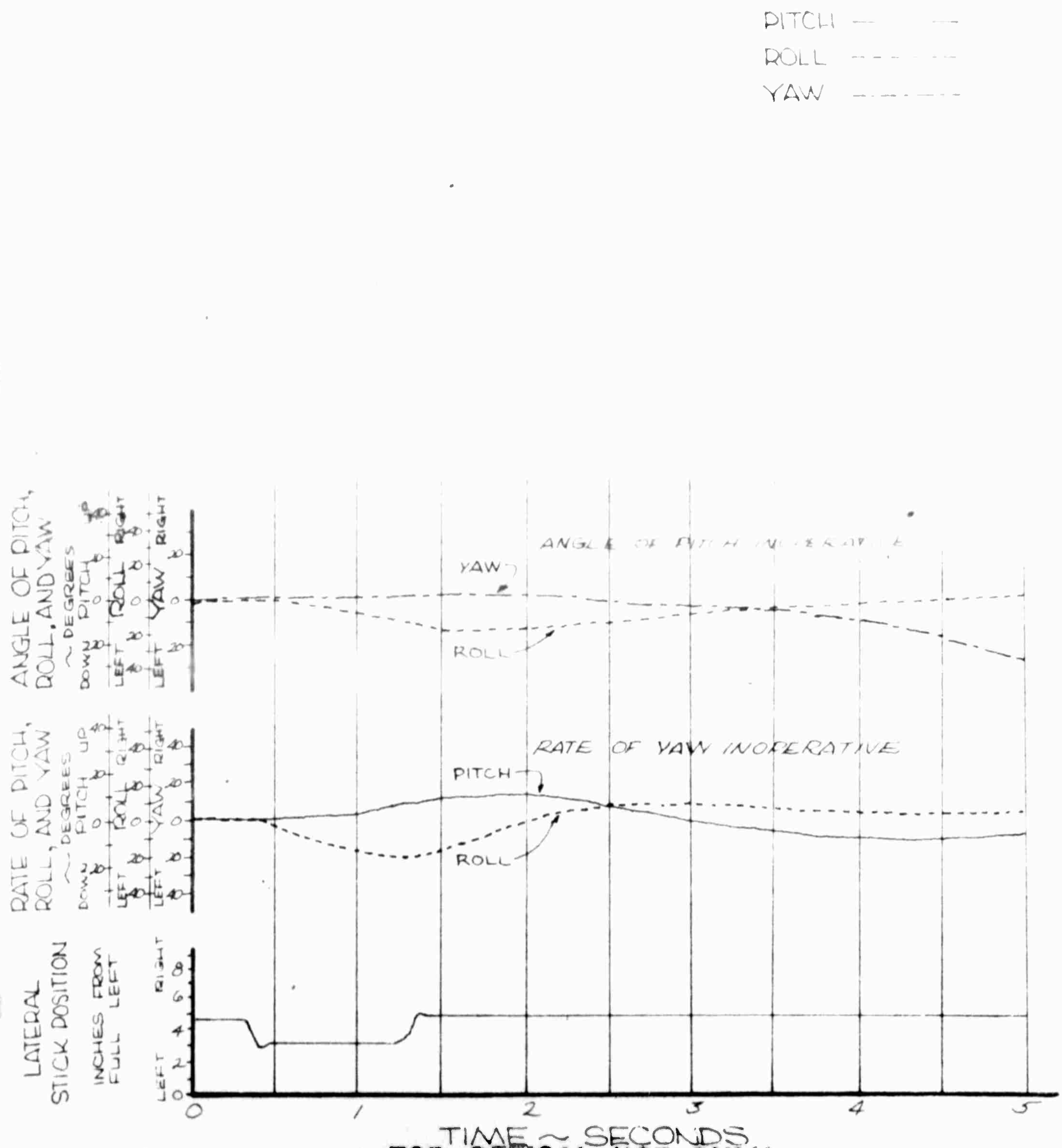


FIGURE NO. 63

RIGHT LATERAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: CLEAN
FULL LATERAL TRAVEL: 9.5 INCHES
AVERAGE GROSS WEIGHT: 2570 LBS
LONG. C.G. LOCATION: 105.5 IN (AFT)
LATERAL C.G. LOCATION: .35 IN (RT)

FLIGHT CONDITION: HOVER (IGE)
TRIM CAS: ZERO
DENSITY ALTITUDE: 780 FEET
ROTOR SPEED: 394 RPM
SAE CONDITION: OFF

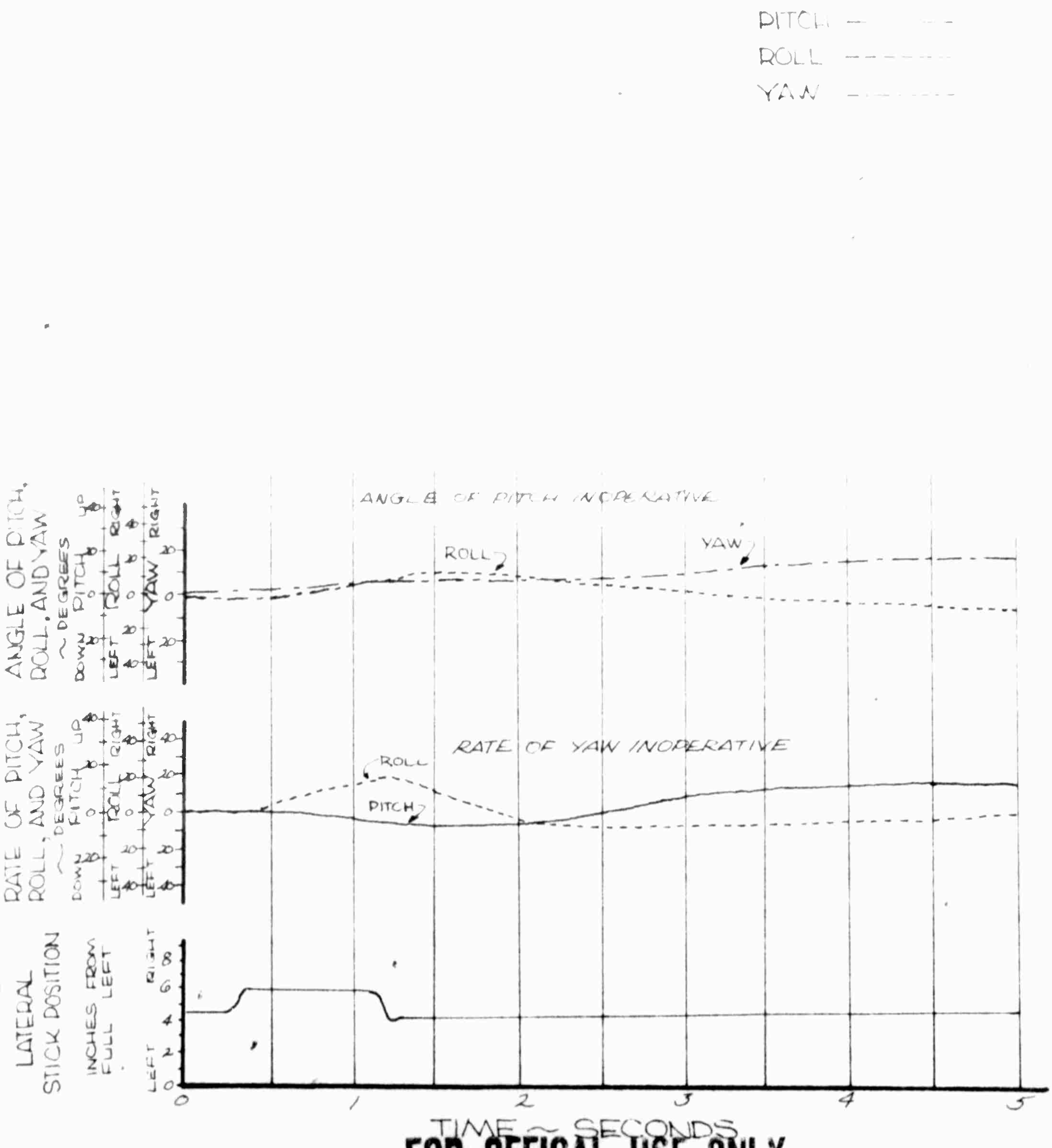


FIGURE NO. 64

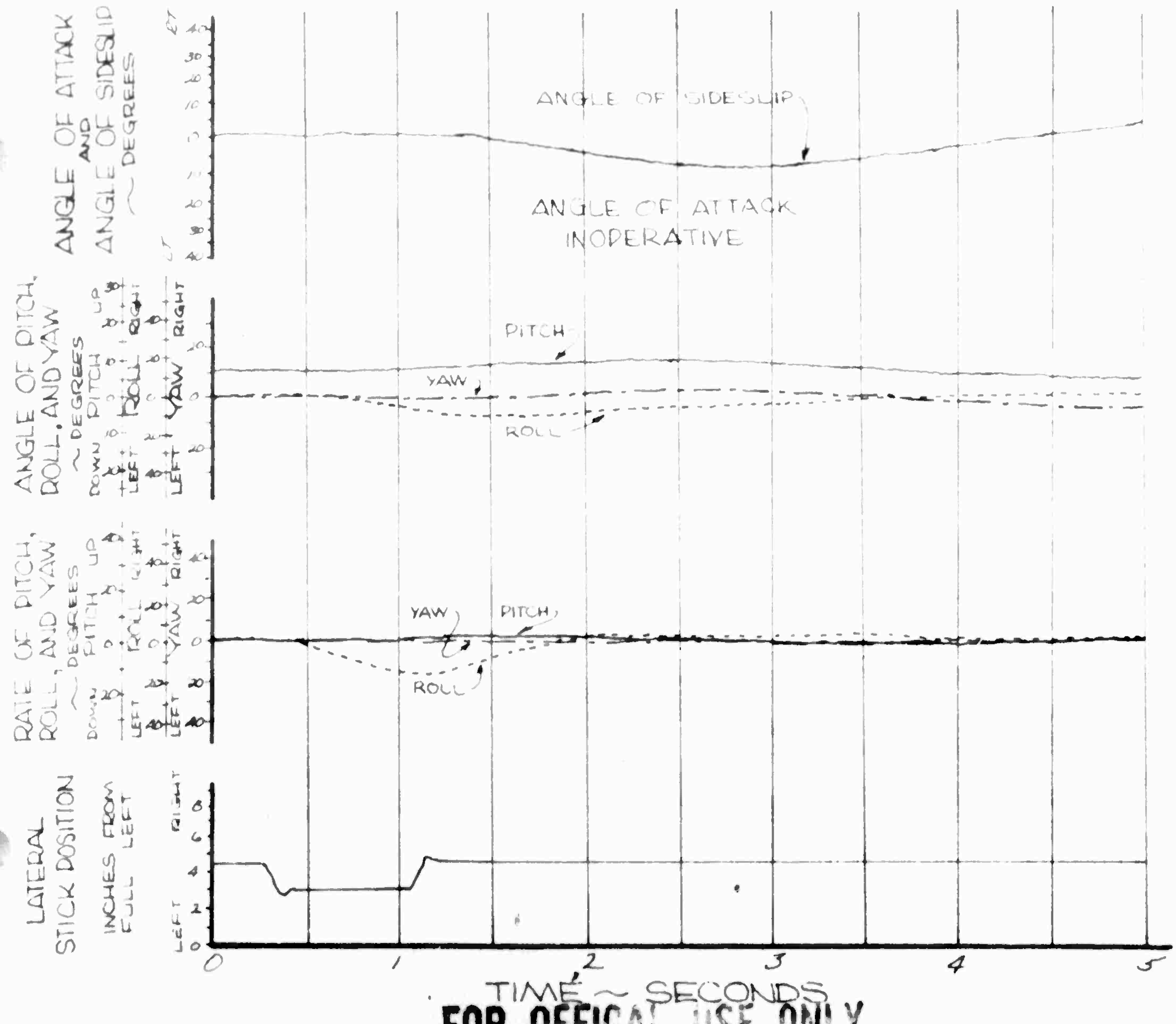
LEFT LATERAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: CLEAN
FULL LATERAL TRAVEL: 9.5 INCHES
AVERAGE GROSS WEIGHT: 2635 LBS
LONG. C.G. LOCATION: 105.8 IN. (AFT)
LATERAL C.G. LOCATION: .35 IN (RT)

FLIGHT CONDITION: LEVEL FLIGHT
TRIM CAS: 35 KNOTS
DENSITY ALTITUDE: 4515 FEET
ROTOR SPEED: 394 RPM
SAE CONDITION: OFF

PITCH
ROLL
YAW



FOR OFFICAL USE ONLY

FIGURE NO. 65

LEFT LATERAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: CLEAN
FULL LATERAL TRAVEL: 9.5 INCHES
AVERAGE GROSS WEIGHT: 2600 LBS
LONG. C.G. LOCATION: 105.6 IN (AFT)
LATERAL C.G. LOCATION: .35 IN. (RT)

FLIGHT CONDITION: LEVEL FLIGHT
TRIM CAS: 100.5 KNOTS
DENSITY ALTITUDE: 4670 FEET
ROTOR SPEED: 394 RPM
SAS CONDITION: OFF

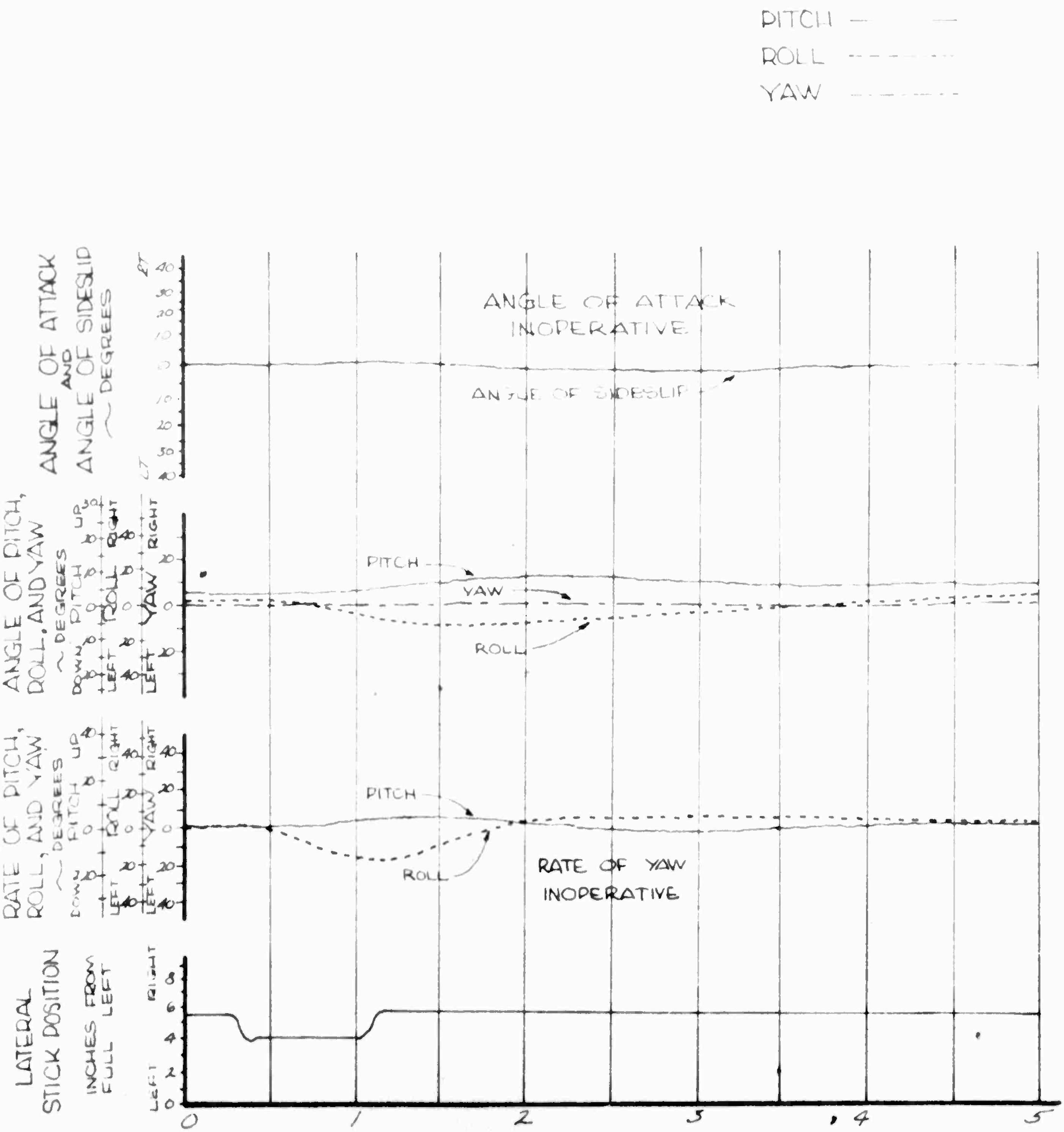
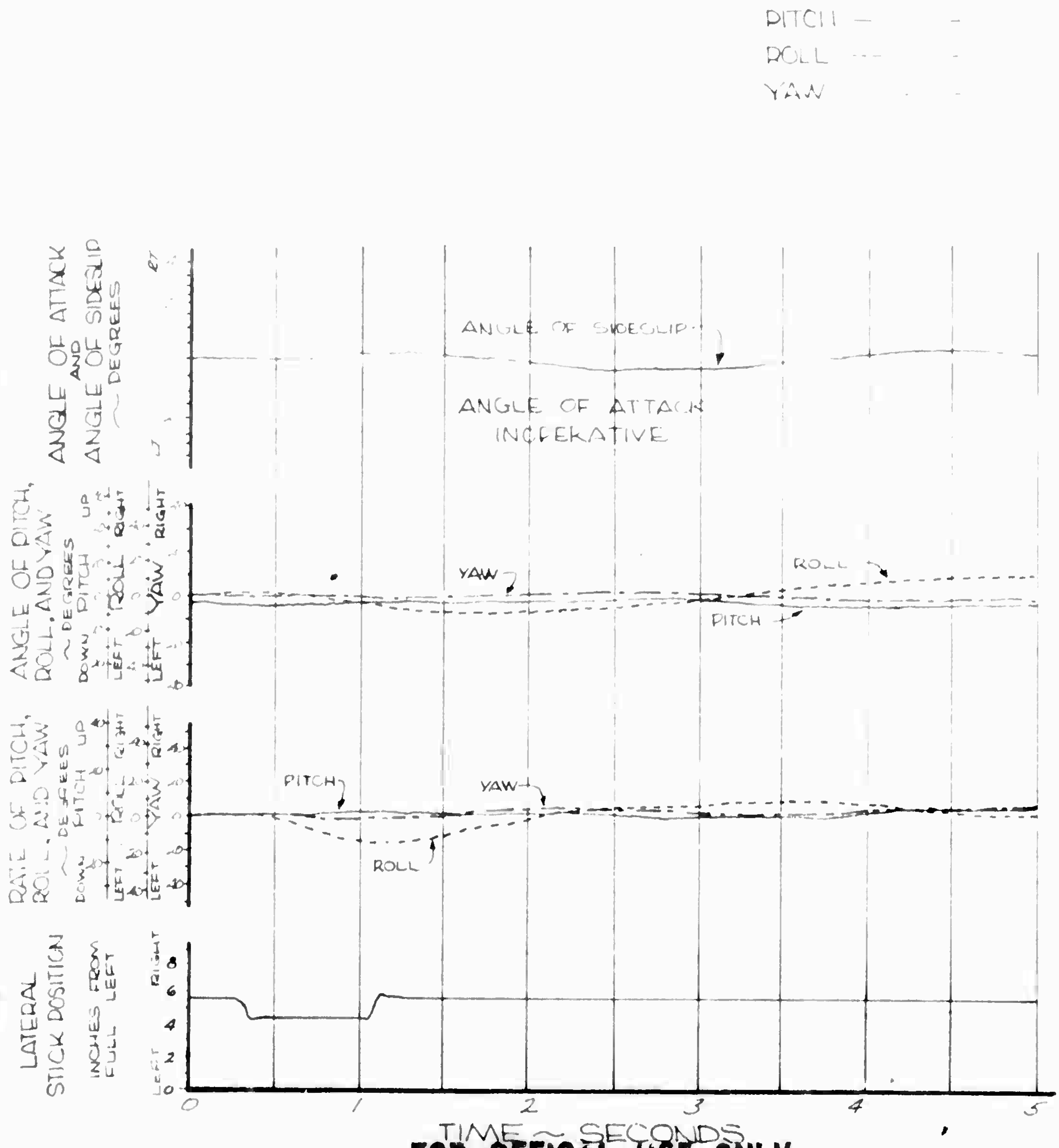


FIGURE NO. 66

LEFT LATERAL PULSE

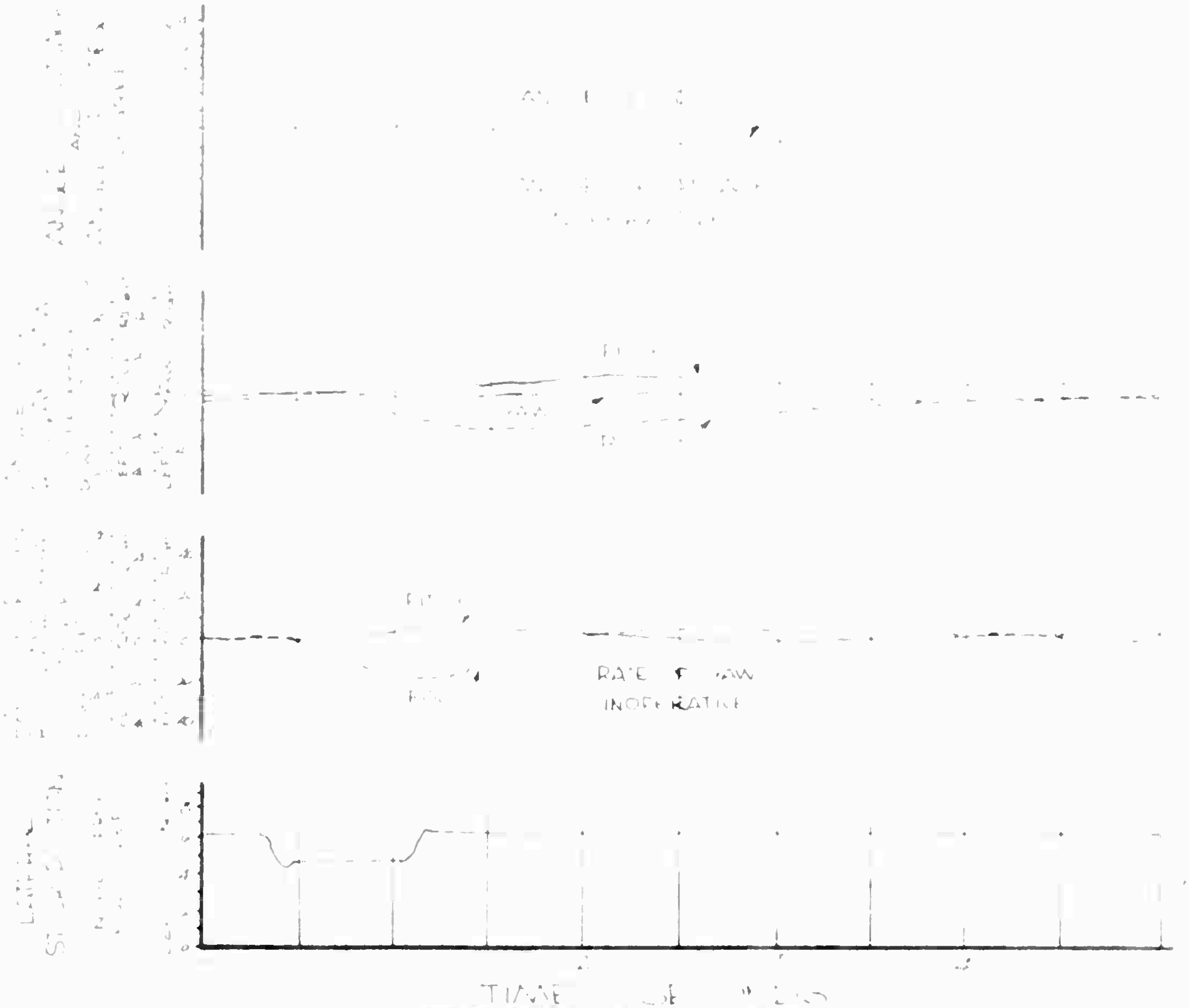
OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: CLEAN	FLIGHT CONDITION: LEVEL FLIGHT
FULL LATERAL TRAVEL: 9.5 INCHES	TRIM CAS: 103 KNOTS
AVERAGE GROSS WEIGHT: 2535 LBS	DENSITY ALTITUDE: 4505 FEET
LONG. C.G. LOCATION: 99.4 IN (FWD)	ROTOR SPEED: 394 RPM
LATERAL C.G. LOCATION: .35 IN (RT)	SAS CONDITION: OFF



FOR OFFICAL USE ONLY

LEFT LATERAL PULSE



FOR OFFICIAL USE ONLY

FIGURE NO. 68

LEFT LATERAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: CLEAN
FULL LATERAL TRAVEL: 9.5 IN.
AVERAGE GROSS WEIGHT: 2520 LBS.
LONG. C.G. LOCATION: 105.2 IN. (AFT)
LATERAL C.G. LOCATION: .35 IN. (RT)

FLIGHT CONDITION: LEVEL FLIGHT
TRIM CAS: 89 KNOTS
DENSITY ALTITUDE: 9600 FT
ROTOR SPEED: 394 RPM
SAE CONDITION: OFF

PITCH
ROLL
YAW

FOR OFFICAL USE ONLY

FIGURE NO. 69

LEFT LATERAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: CLEAN
FULL LATERAL TRAVEL: 9.5 INCHES
AVERAGE GROSS WEIGHT: 2655 LBS
LONG. C.G. LOCATION: 105.9 IN (AFT)
LATERAL C.G. LOCATION: .35 IN (RT)

FLIGHT CONDITION: CLIMB
TRIM CAS: 45 KNOTS
DENSITY ALTITUDE: 5000 FEET
ROTOR SPEED: 394 RPM
SAE CONDITION: OFF

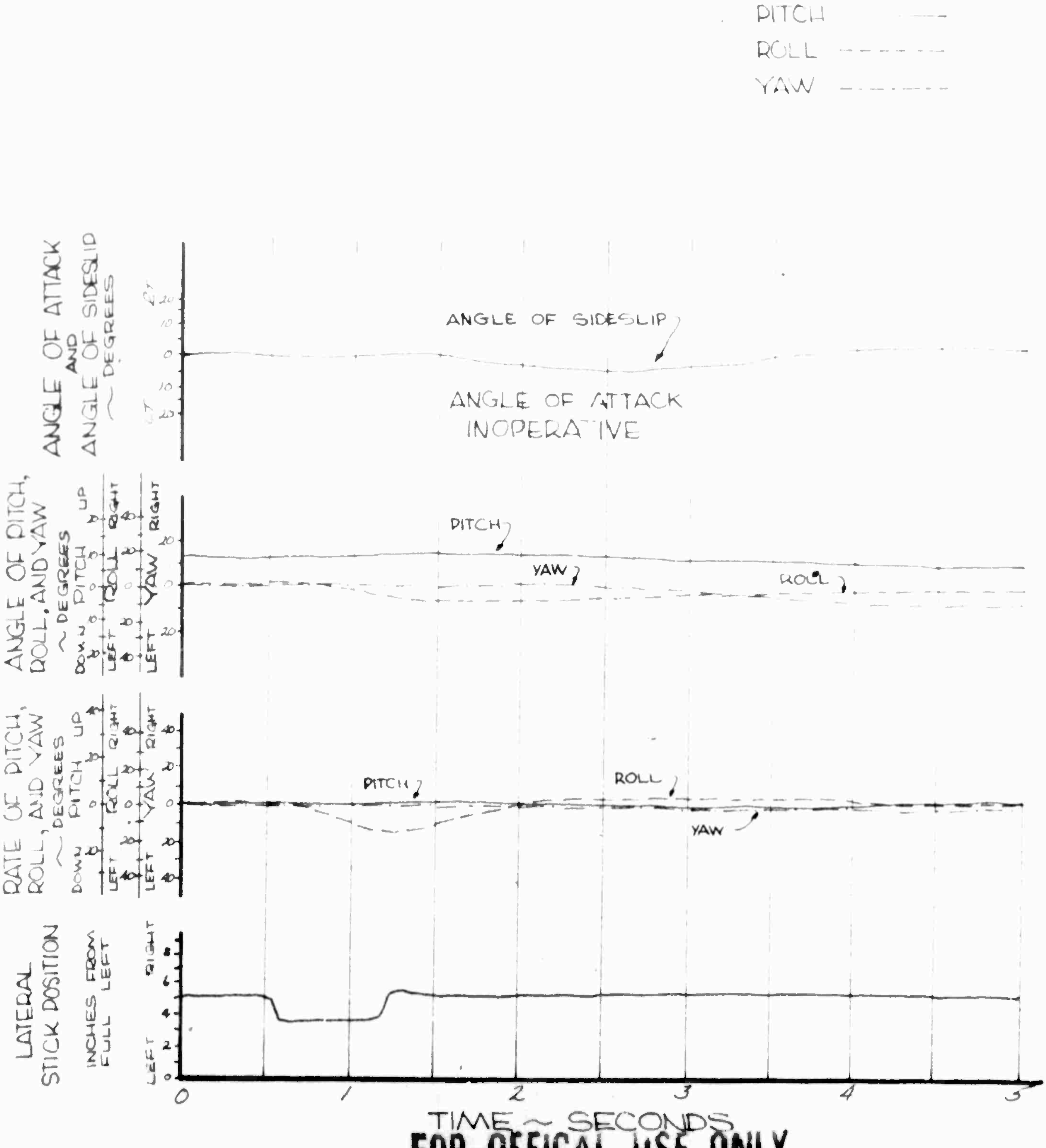


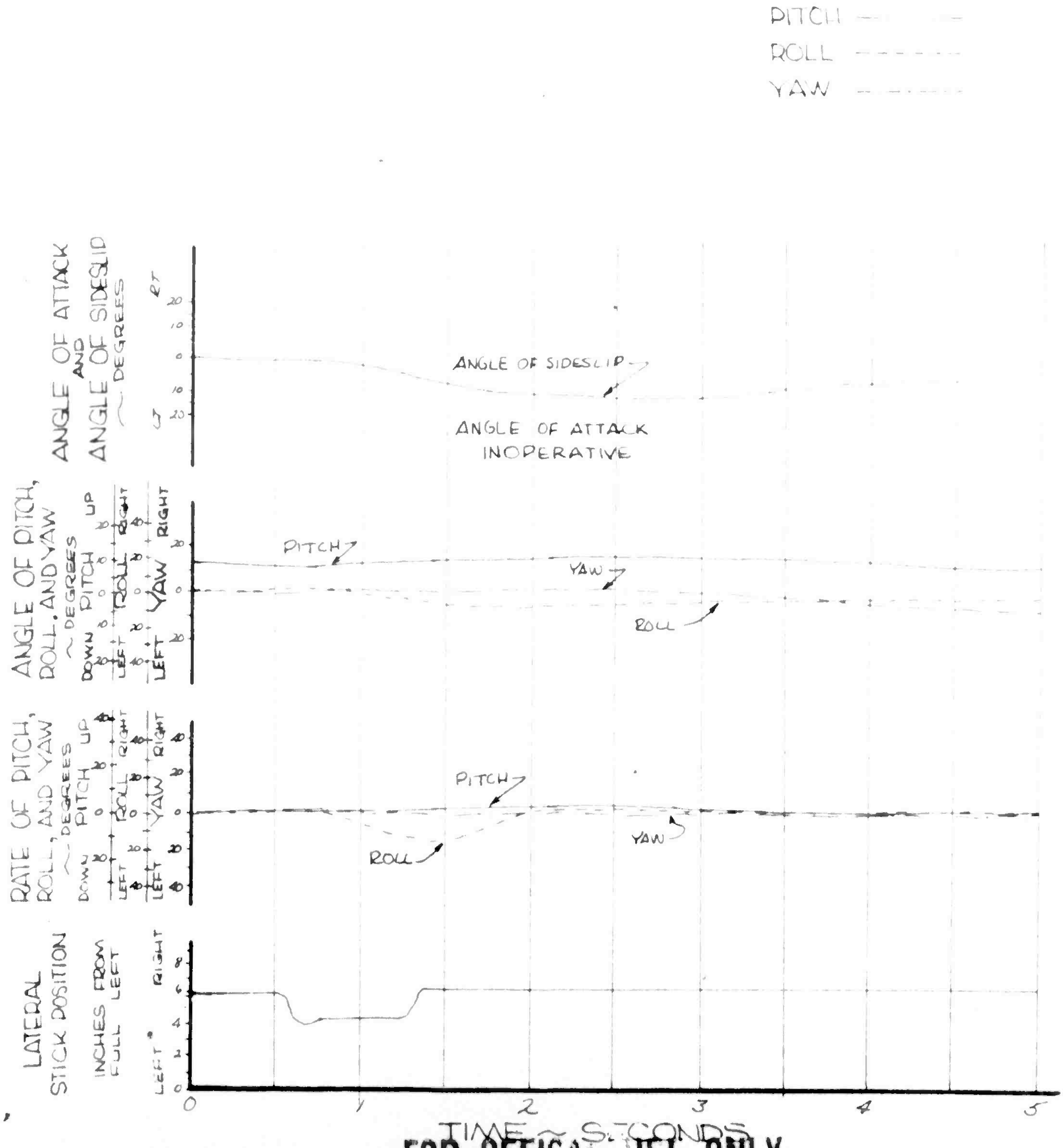
FIGURE NO. 70

LEFT LATERAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: CLEAN
FULL LATERAL TRAVEL: 9.5 INCHES
AVERAGE GROSS WEIGHT: 2650 LBS
LONG. C.G. LOCATION: 105.85 IN. (AFT)
LATERAL C.G. LOCATION: .35 IN (RT)

FLIGHT CONDITION: AUTOROTATION
TRIM CAS: 45 KNOTS
DENSITY ALTITUDE: 5000 FEET
ROTOR SPEED: 394 RPM
SAS CONDITION: OFF



FOR OFFICAL USE ONLY

FIGURE NO. 71

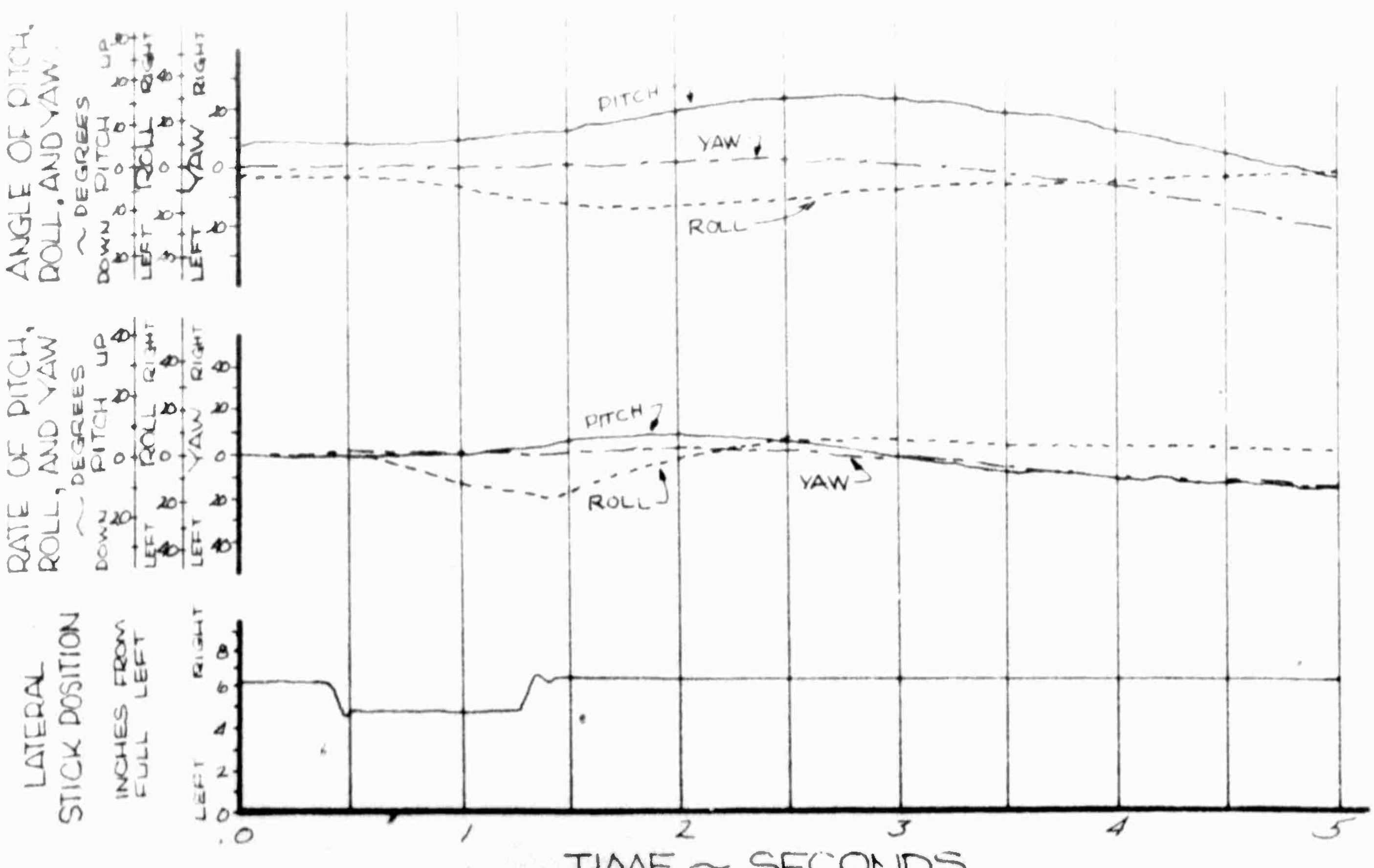
LEFT LATERAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-7 STOWED
FULL LATERAL TRAVEL: 9.5 INCHES
AVERAGE GROSS WEIGHT: 2580 LBS
LONG. C.G. LOCATION: 104.6 IN (AFT)
LATERAL C.G. LOCATION: 1.25 IN (LT)

FLIGHT CONDITION: HOVER (IGE)
TRIM CAS: ZERO
DENSITY ALTITUDE: 760 FEET
ROTOR SPEED: 394 RPM
SAE CONDITION: OFF

PITCH
ROLL
YAW



FOR OFFICAL USE ONLY

FIGURE NO. 72

LEFT LATERAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-7 STOWED
FULL LATERAL TRAVEL: 9.5 IN
AVERAGE GROSS WEIGHT: 2560 LBS.
LONG. C.G. LOCATION: 104.5 IN (AFT)
LATERAL C.G. LOCATION: 1.25 IN (LT)

FLIGHT CONDITION: HOVER (IGE)
TRIM CAS: ZERO
DENSITY ALTITUDE: 760 FEET
ROTOR SPEED: 394 RPM
SAE CONDITION: ON

PITCH ———
ROLL - - - - -
YAW — - — - —

FOR OFFICAL USE ONLY

FIGURE NO. 73

LEFT LATERAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM- / STOWED
FULL LATERAL TRAVEL: 15 INCHES
AVERAGE GROSS WEIGHT: 2570 LBS
LONG. C.G. LOCATION: 104.6 IN (AFT)
LATERAL C.G. LOCATION: 1.25 IN (LT)

FLIGHT CONDITION: LEVEL FLIGHT
TRIM CAS: 92 KNOTS
DENSITY ALTITUDE: 4970 FEET
ROTOR SPEED: 394 RPM
SAE CONDITION: OFF

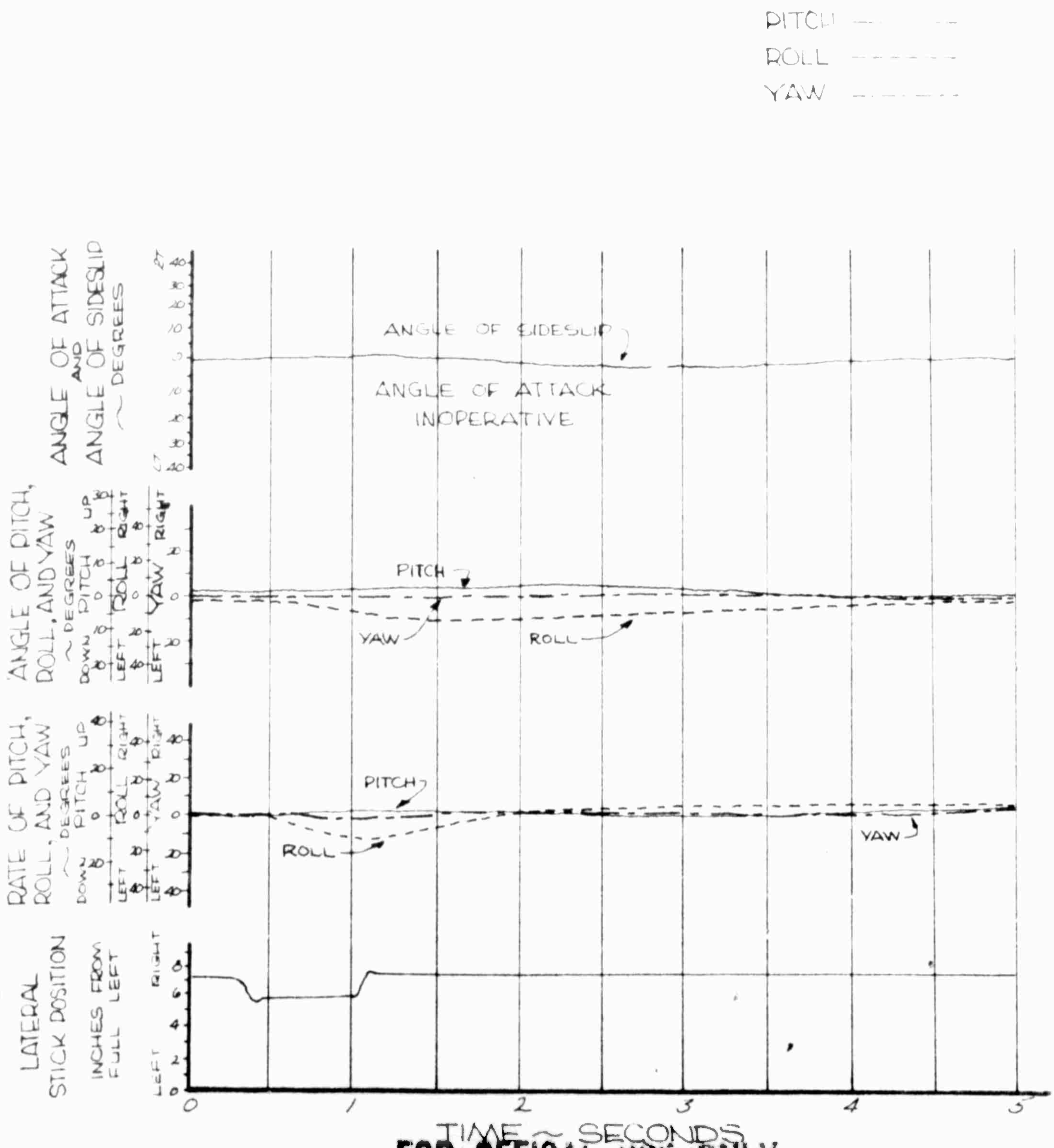


FIGURE NO. 74

LEFT LATERAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-7 STOWED
FULL LATERAL TRAVEL: 9.5 INCHES
AVERAGE GROSS WEIGHT: 2595 LBS.
LONG. C.G. LOCATION: 104.7 IN (AFT)
LATERAL C.G. LOCATION: 1.25 IN (LT)

FLIGHT CONDITION: LEVEL FLIGHT
TRIM CAS: 92 KNOTS
DENSITY ALTITUDE: 4840 FEET
ROTOR SPEED: 394 RPM
SAE CONDITION: ON

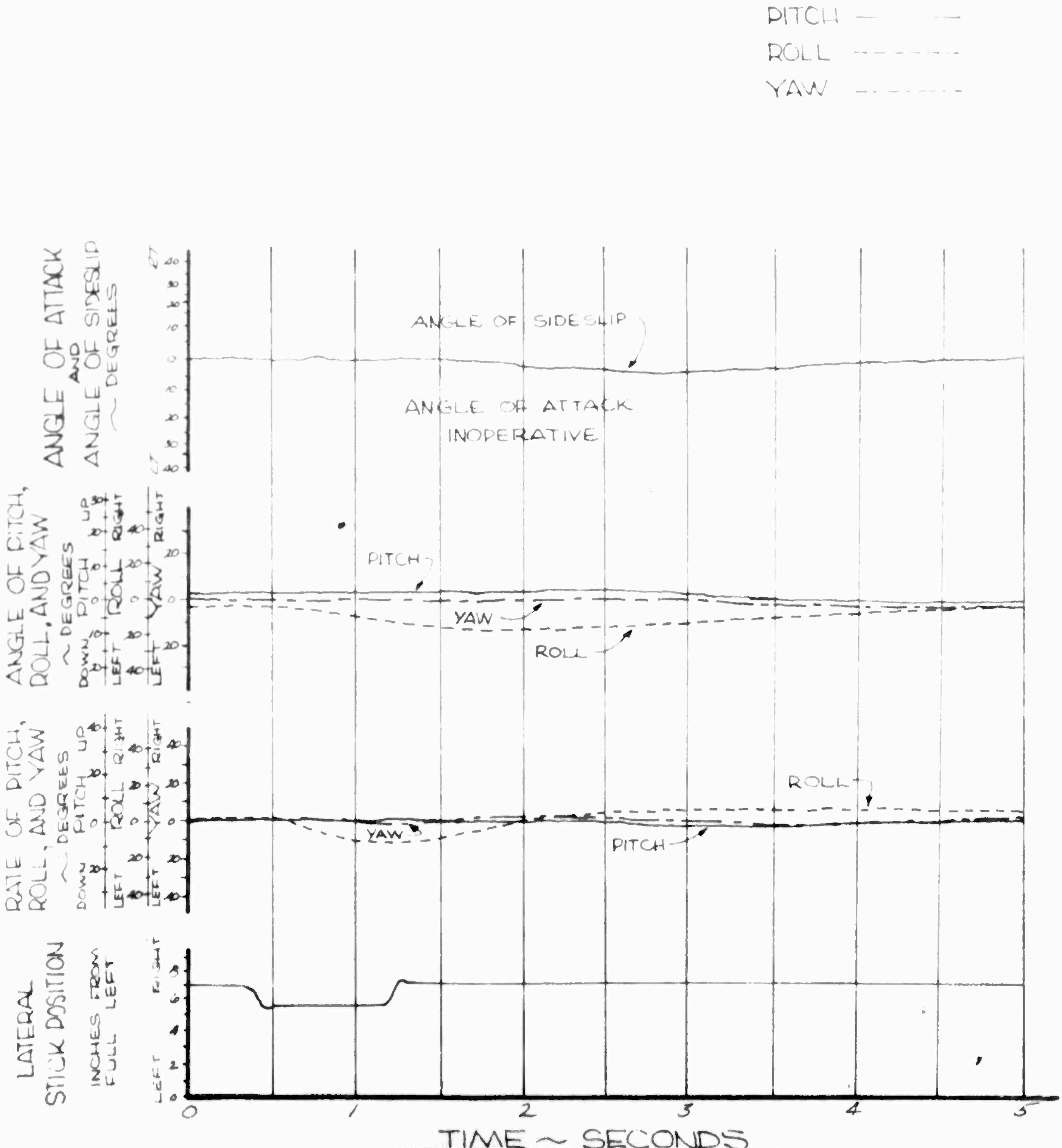


FIGURE NO. 75

LEFT LATERAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-8 STOWED

FULL LATERAL TRAVEL: 9.5 INCHES

AVERAGE GROSS WEIGHT: 2495 LBS

LONG. C.G. LOCATION: 104.9 IN (AFT)

LATERAL C.G. LOCATION: 1.30 IN (LT)

FLIGHT CONDITION: LEVEL FLIGHT

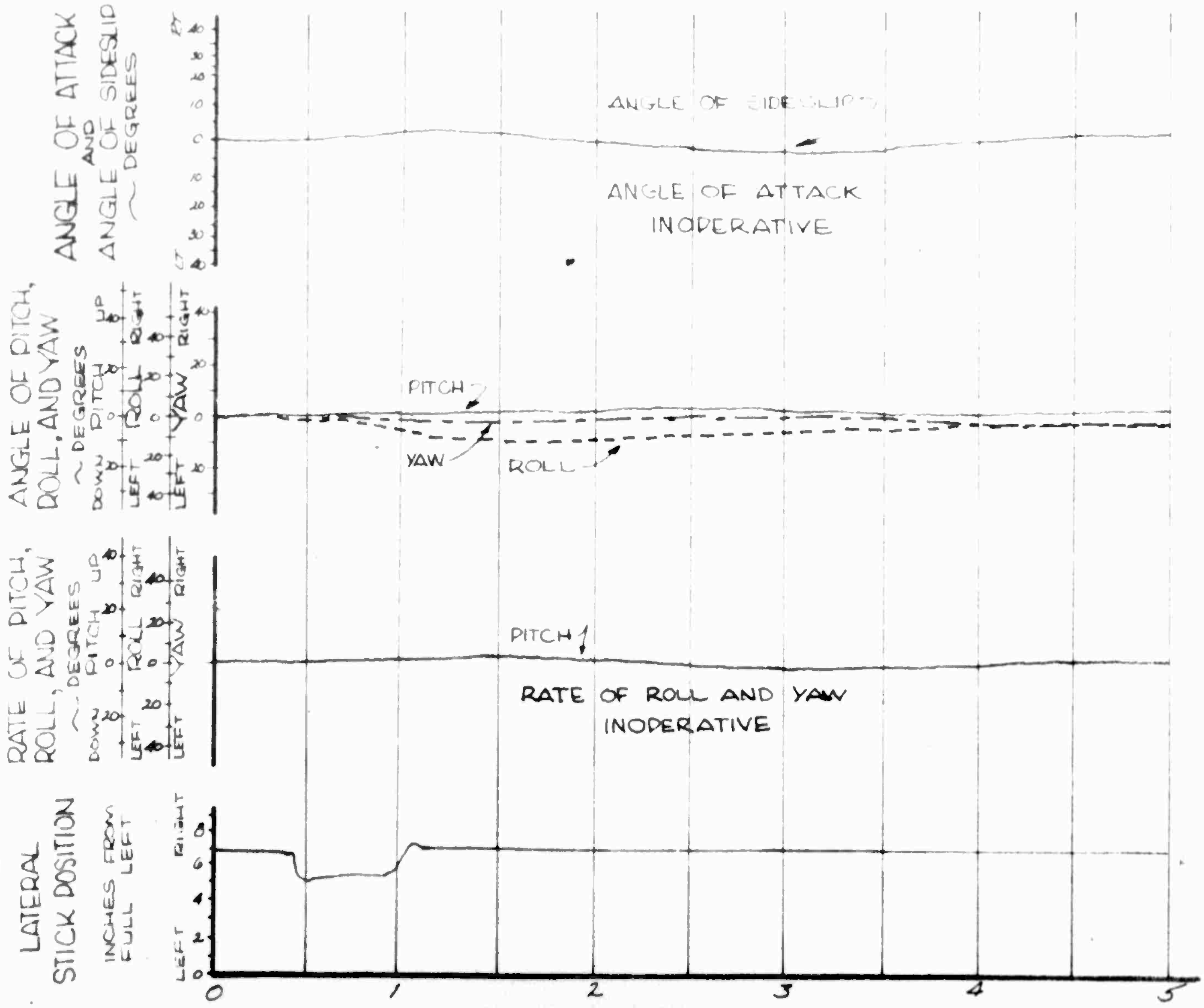
TRIM CAS: 98 KNOTS

DENSITY ALTITUDE: 5050 FEET

ROTOR SPEED: 394 RPM

SAE CONDITION: OFF

PITCH — — —
ROLL - - - - - -
YAW — - — - —



TIME ~ SECONDS

FIGURE NO. 76

LEFT LATERAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-8 STOWED
FULL LATERAL TRAVEL: 9.5 INCHES
AVERAGE GROSS WEIGHT: 2585 LBS
LONG. C.G. LOCATION: 105.1 IN (AFT)
LATERAL C.G. LOCATION: 1.30 IN (LT)

FLIGHT CONDITION: LEVEL FLIGHT
TRIM CAS: 98 KNOTS
DENSITY ALTITUDE: 5220
ROTOR SPEED: 394 RPM
SAE CONDITION: ON

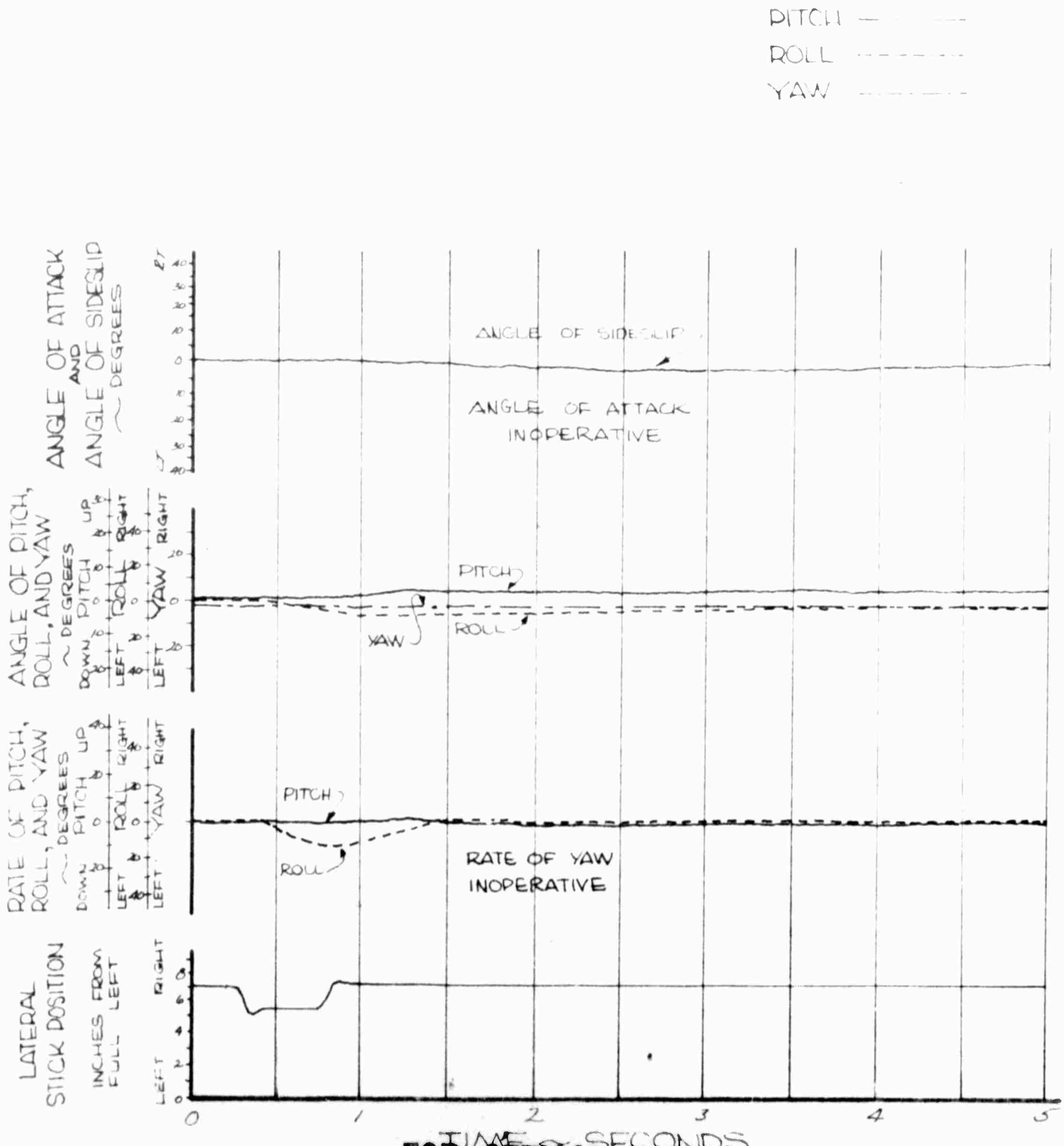


FIGURE NO. 77

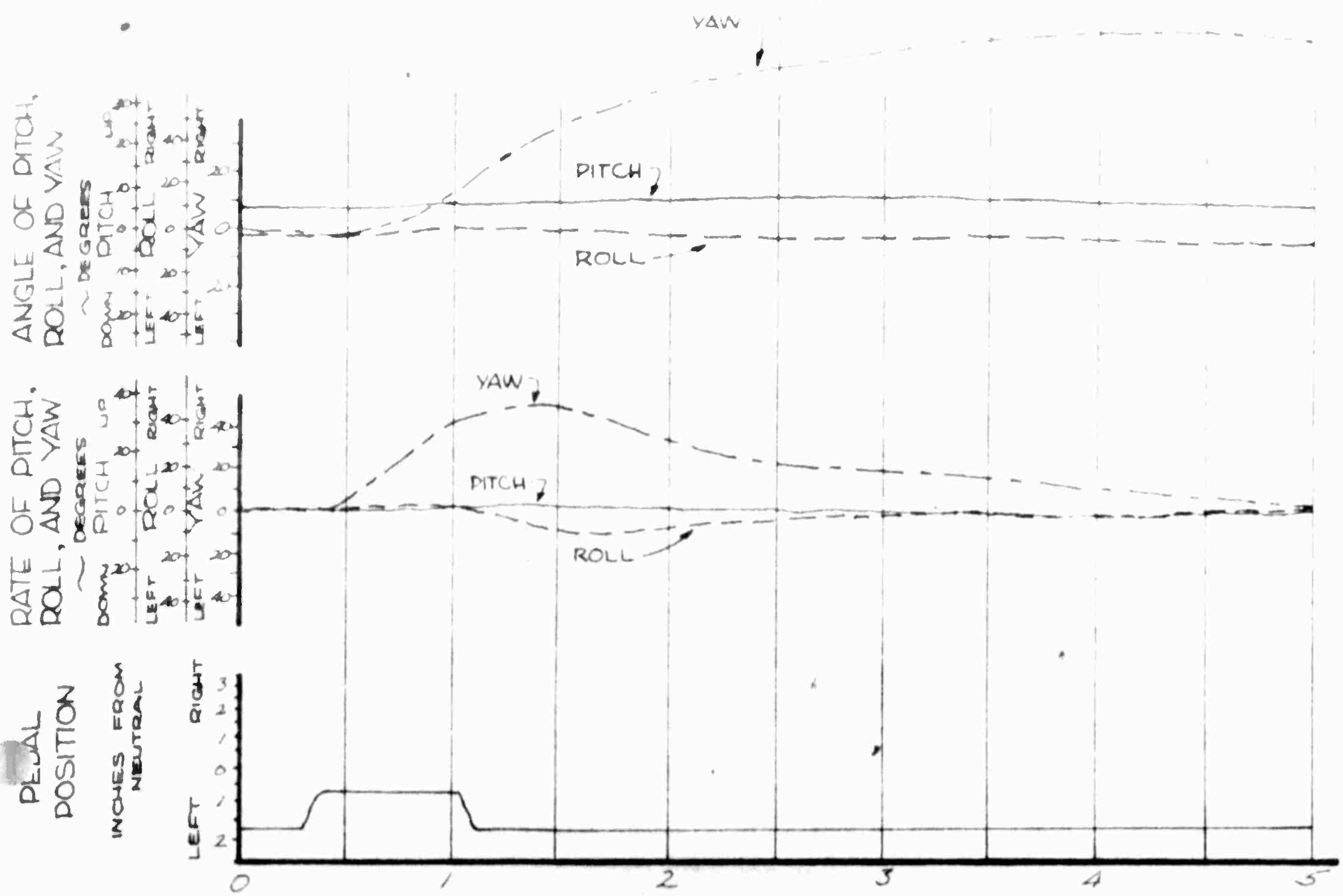
RIGHT DIRECTIONAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: CLEAN
FULL PEDAL TRAVEL: ±2.6 INCHES
AVERAGE GROSS WEIGHT: 2455 LBS.
LONG C.G. LOCATION: 105.0 IN. (AFT)
LATERAL C.G. LOCATION: .35 IN (RT)

FLIGHT CONDITION: HOVER (IGE)
TRIM CAS: ZERO
DENSITY ALTITUDE: 1070 FEET
ROTOR SPEED: 394 RPM
SAE CONDITION: OFF

PITCH ————
ROLL – – – –
YAW — - — - —



FOR OFFICAL USE ONLY

FIGURE NO. 78

LEFT DIRECTIONAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: CLEAN
FULL PEDAL TRAVEL: ± 2.6 INCHES
AVERAGE GROSS WEIGHT: 2470 LBS.
LONG. C.G. LOCATION: 104.9 IN. (AFT)
LATERAL C.G. LOCATION: .35 IN. (RT.)

FLIGHT CONDITION: HOVER (IGE)
TRIM CAS: ZERO
DENSITY ALTITUDE: 1070 FEET
ROTOR SPEED: 394 FEET
SAS CONDITION: OFF

PITCH ————
ROLL - - - - - -
YAW -·—·—·-

FOR OFFICAL USE ONLY

FIGURE NO. 79

RIGHT DIRECTIONAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: CLEAN
FULL PEDAL TRAVEL: ±2.6 INCHES
AVERAGE GROSS WEIGHT: 2545 LBS
LONG. C.G. LOCATION: 105.4 IN (AFT)
LATERAL C.G. LOCATION: .35 IN. (RT)

FLIGHT CONDITION: LEVEL FLIGHT
TRIM CAS: 35 KNOTS
DENSITY ALTITUDE: 4820 FEET
ROTOR SPEED: 394 RPM
SAS CONDITION: OFF

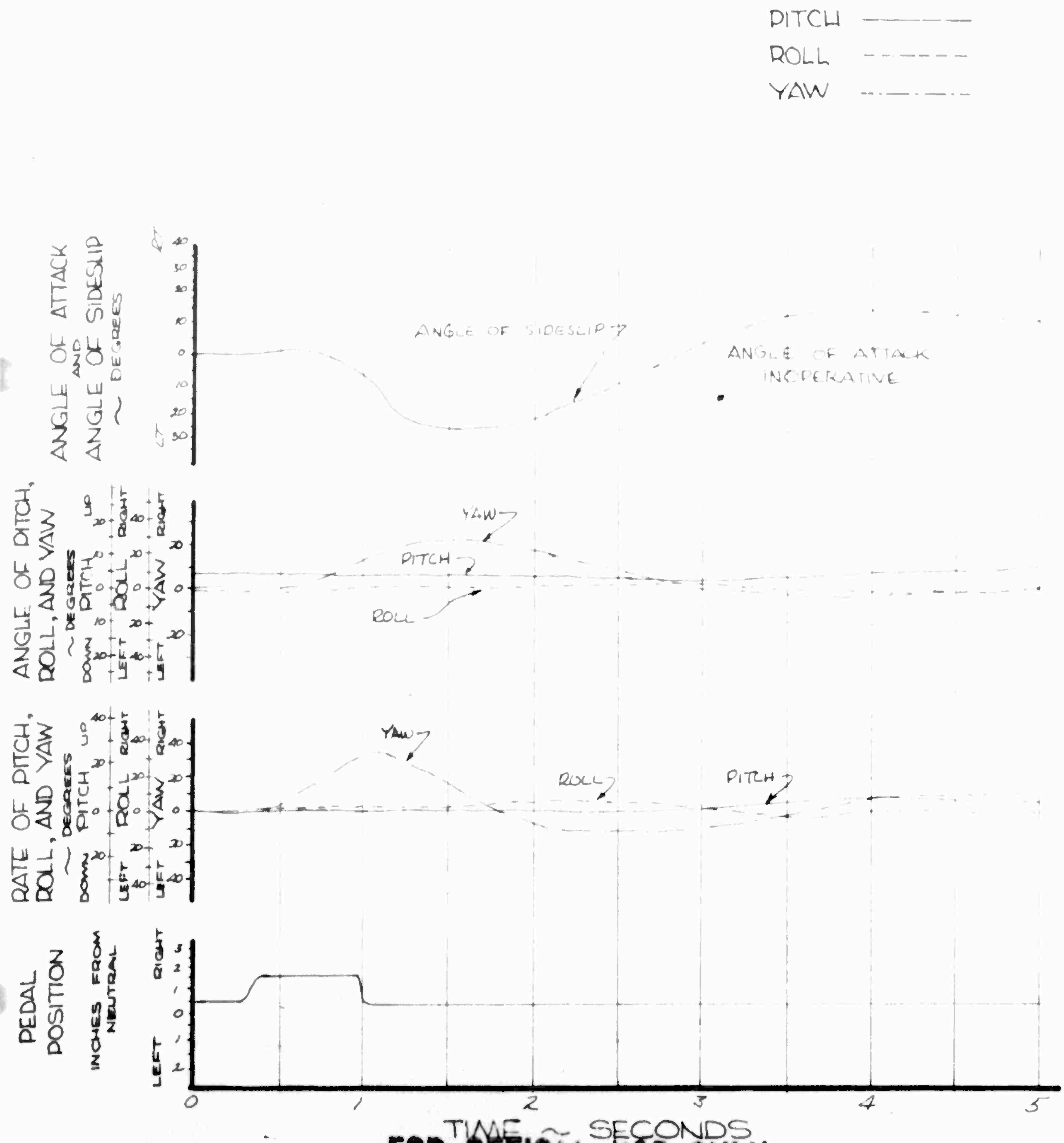


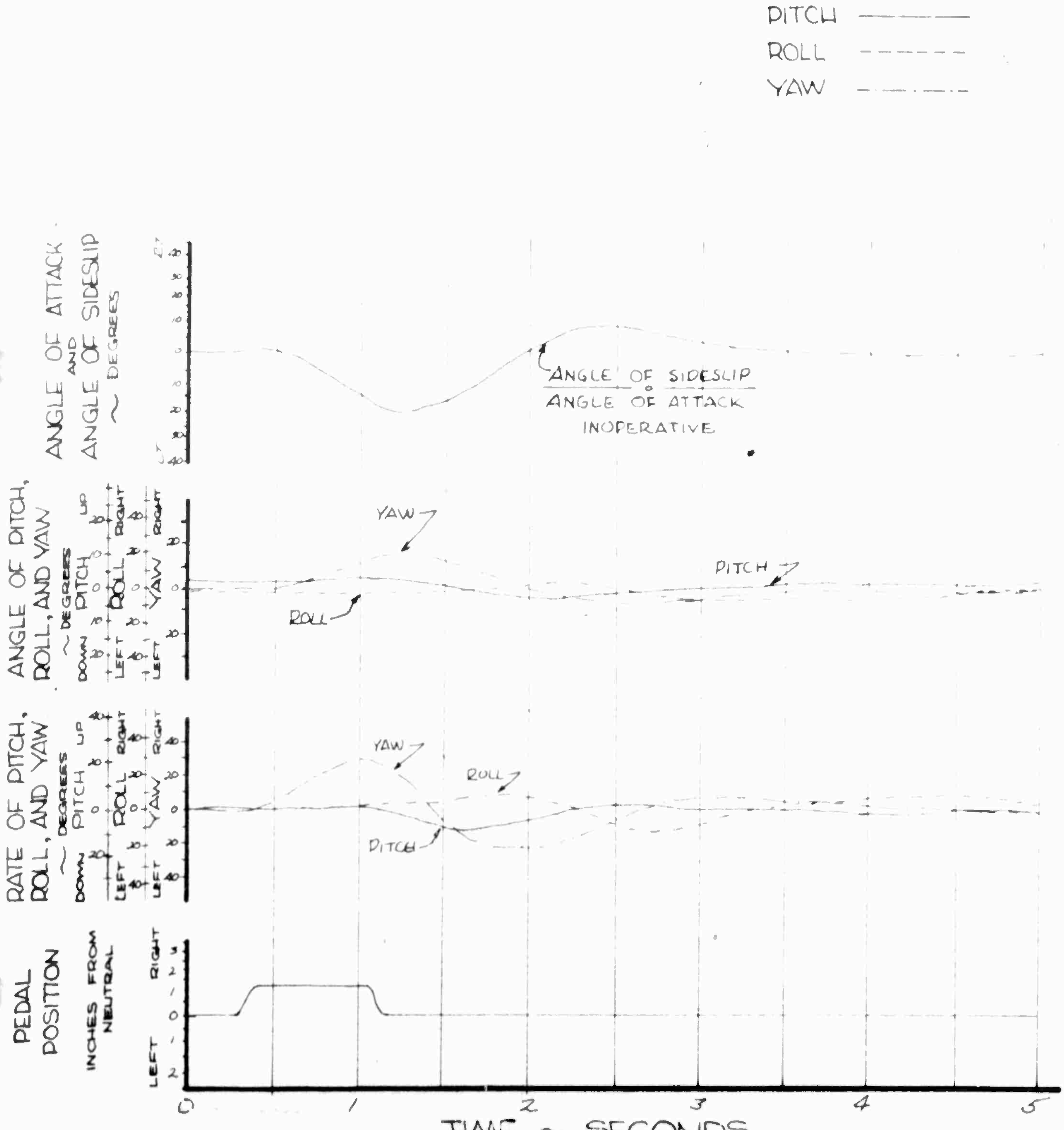
FIGURE NO. 80

RIGHT DIRECTIONAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: CLEAN
FULL PEDAL TRAVEL: ±2.6 INCHES
AVERAGE GROSS WEIGHT: 2490 LBS
LONG. C.G. LOCATION: 105.1 IN. (AFT)
LATERAL C.G. LOCATION: .35 IN (RT.)

FLIGHT CONDITION: LEVEL FLIGHT
TRIM CAS: 100 KNOTS
DENSITY ALTITUDE: 4645 FEET
ROTOR SPEED: 594 RPM
SAS CONDITION: OFF

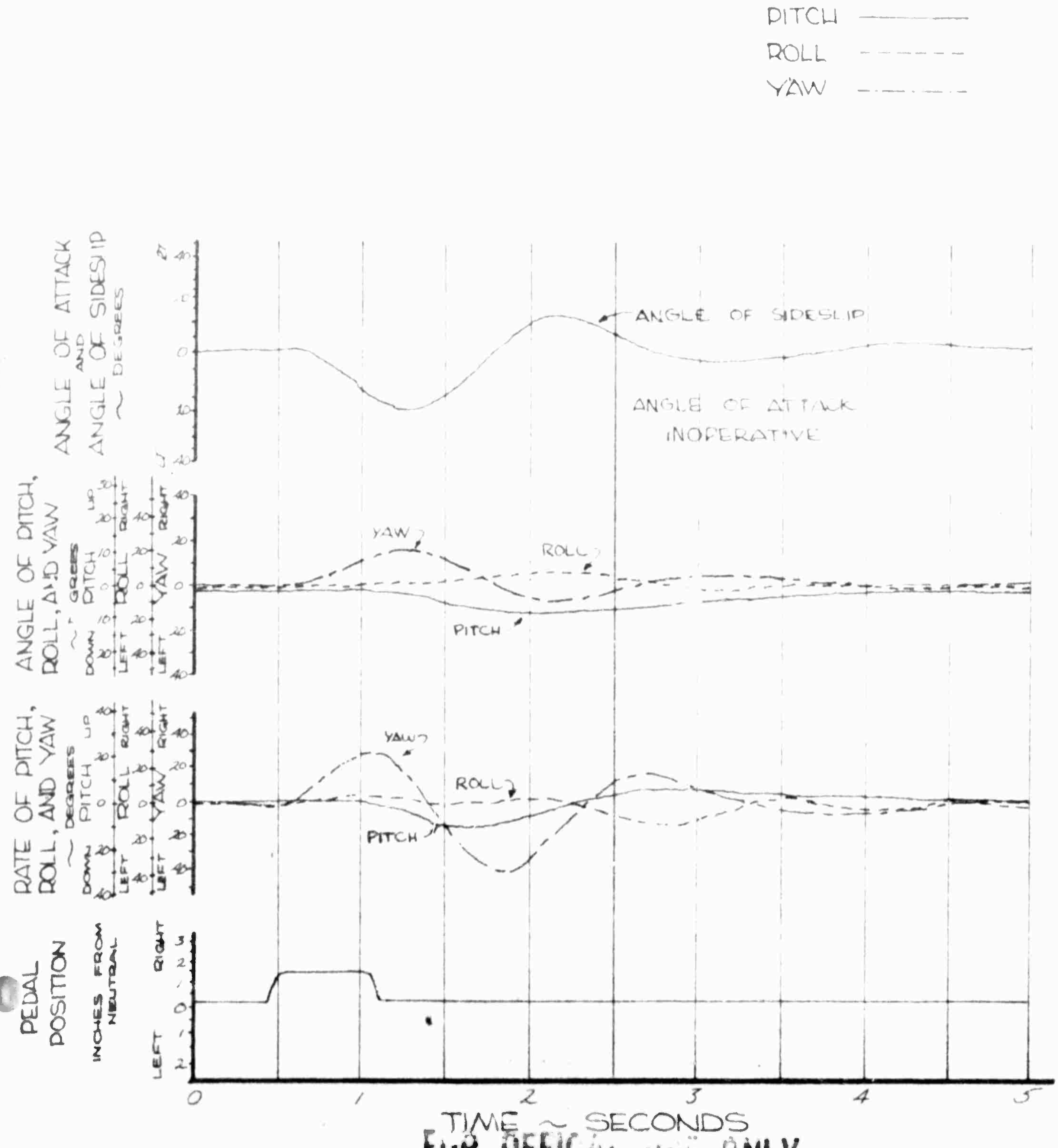


RIGHT DIRECTIONAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: CLEAN
FULL PEDAL TRAVEL: ±2.6 INCHES
AVERAGE GROSS WEIGHT: 2570 LBS
LONG. C.G. LOCATION: 99.7 IN (FWD)
LATERAL C.G. LOCATION: .35 IN (RT)

FLIGHT CONDITION: LEVEL FLIGHT
TRIM CAS: 100 KNOTS
DENSITY ALTITUDE: 4645 FEET
ROTOR SPEED: 394 RPM
SAE CONDITION: OFF



FOR OFFICIAL USE ONLY

FIGURE NO. 82

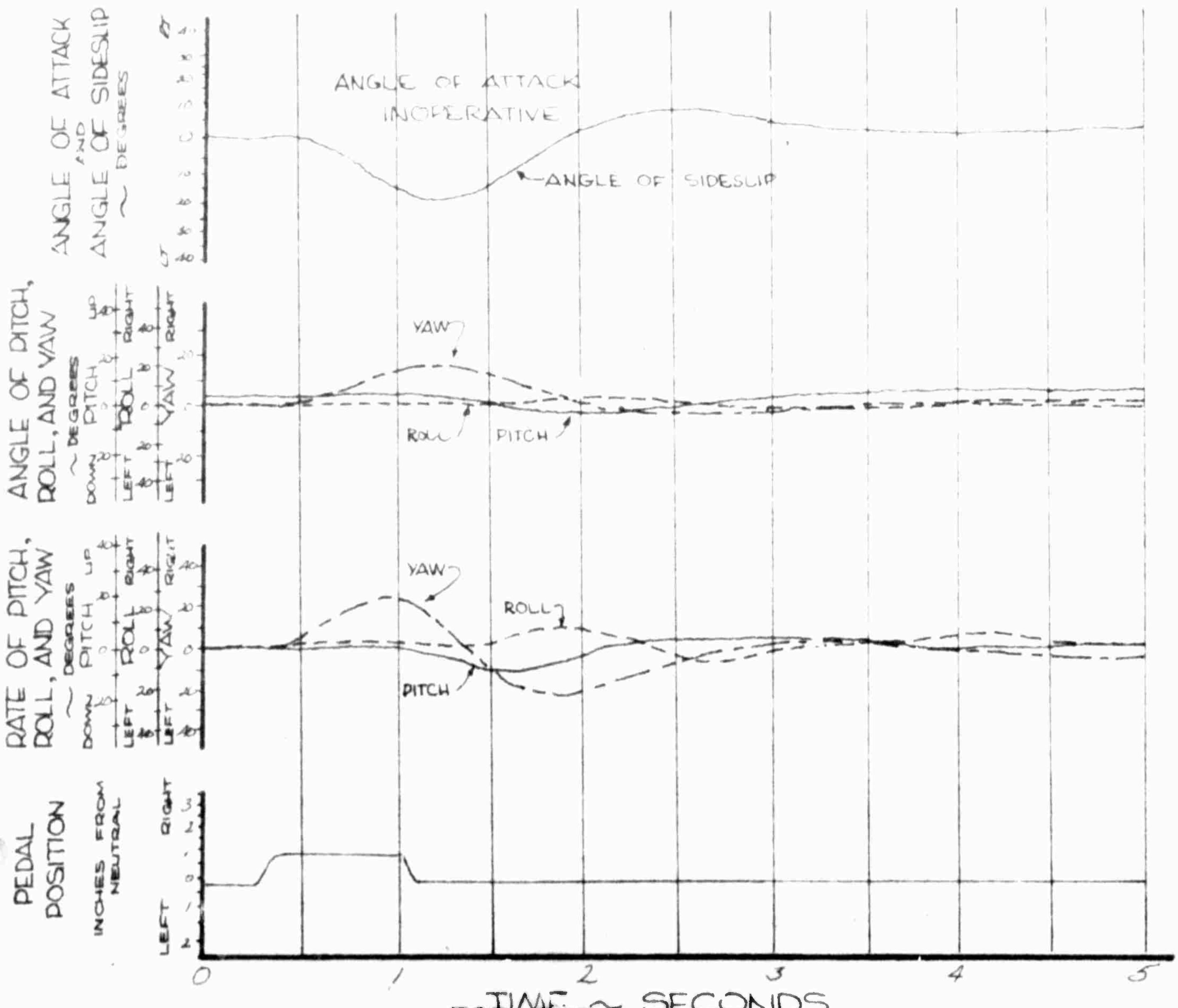
RIGHT DIRECTIONAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: CLEAN
FULL PEDAL TRAVEL: ±2.6 INCHES
AVERAGE GROSS WEIGHT: 2825 LBS
LONG. C.G. LOCATION: 104.6 IN (AFT)
LATERAL C.G. LOCATION: .75 IN. (LT.)

FLIGHT CONDITION: LEVEL FLIGHT
TRIM CAS: 99 KNOTS
DENSITY ALTITUDE: 4820 FEET
ROTOR SPEED: 394 RPM
SAE CONDITION: OFF

PITCH ————
ROLL - - - - - -
YAW — · — · —



FOR OFFICAL USE ONLY

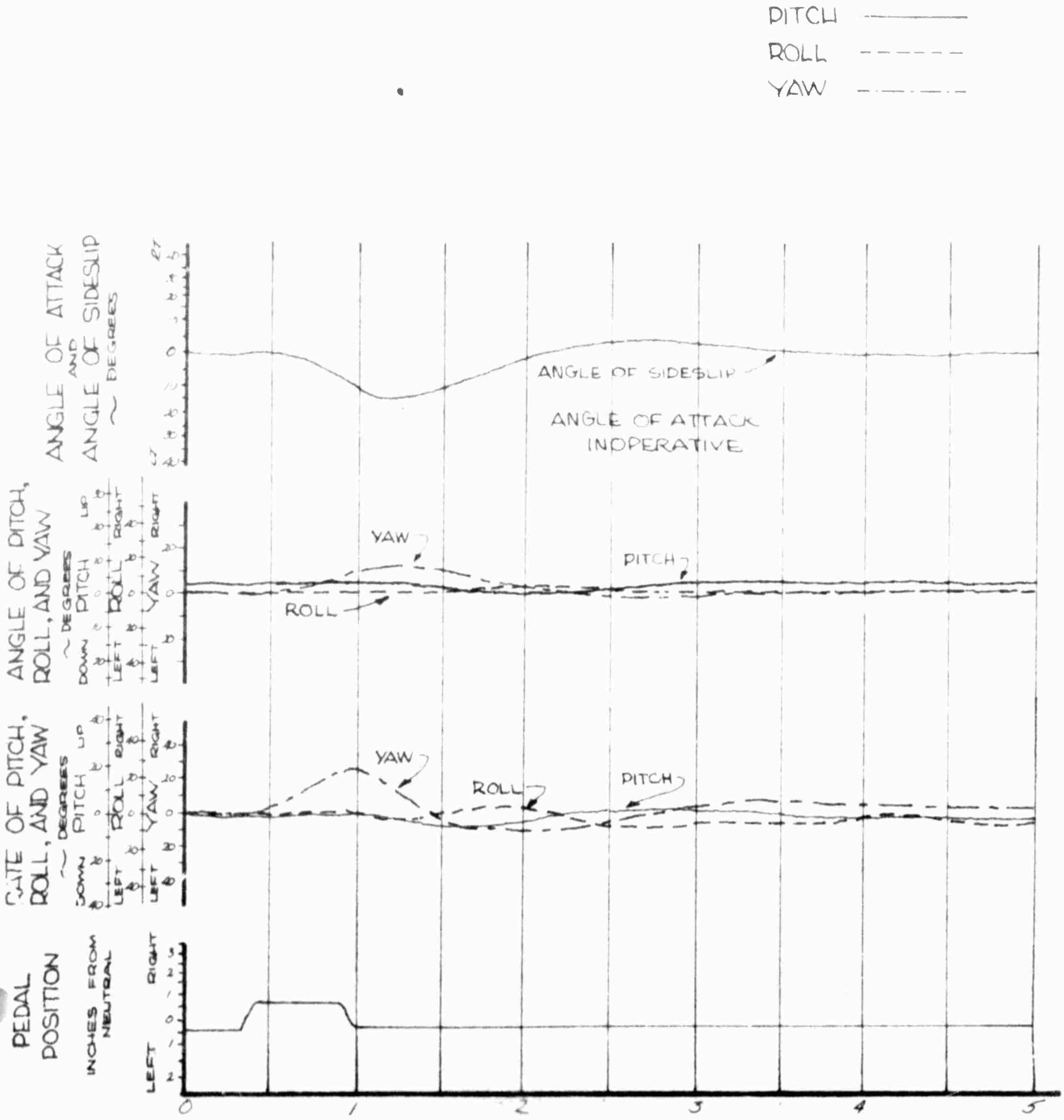
FIGURE NO. 83

RIGHT DIRECTIONAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION : CLEAN
FULL PEDAL TRAVEL : ± 2.6 INCHES
AVERAGE GROSS WEIGHT : 2495 LBS
LONG. C.G. LOCATION : 105.1 IN (AFT)
LATERAL C.G. LOCATION : .35 IN (RT)

FLIGHT CONDITION : LEVEL FLIGHT
TRIM CAS : 92 KNOTS
DENSITY ALTITUDE : 9395 FEET
ROTOR SPEED : 394 RPM
SAE CONDITION : OFF



FOR OFFICAL USE ONLY

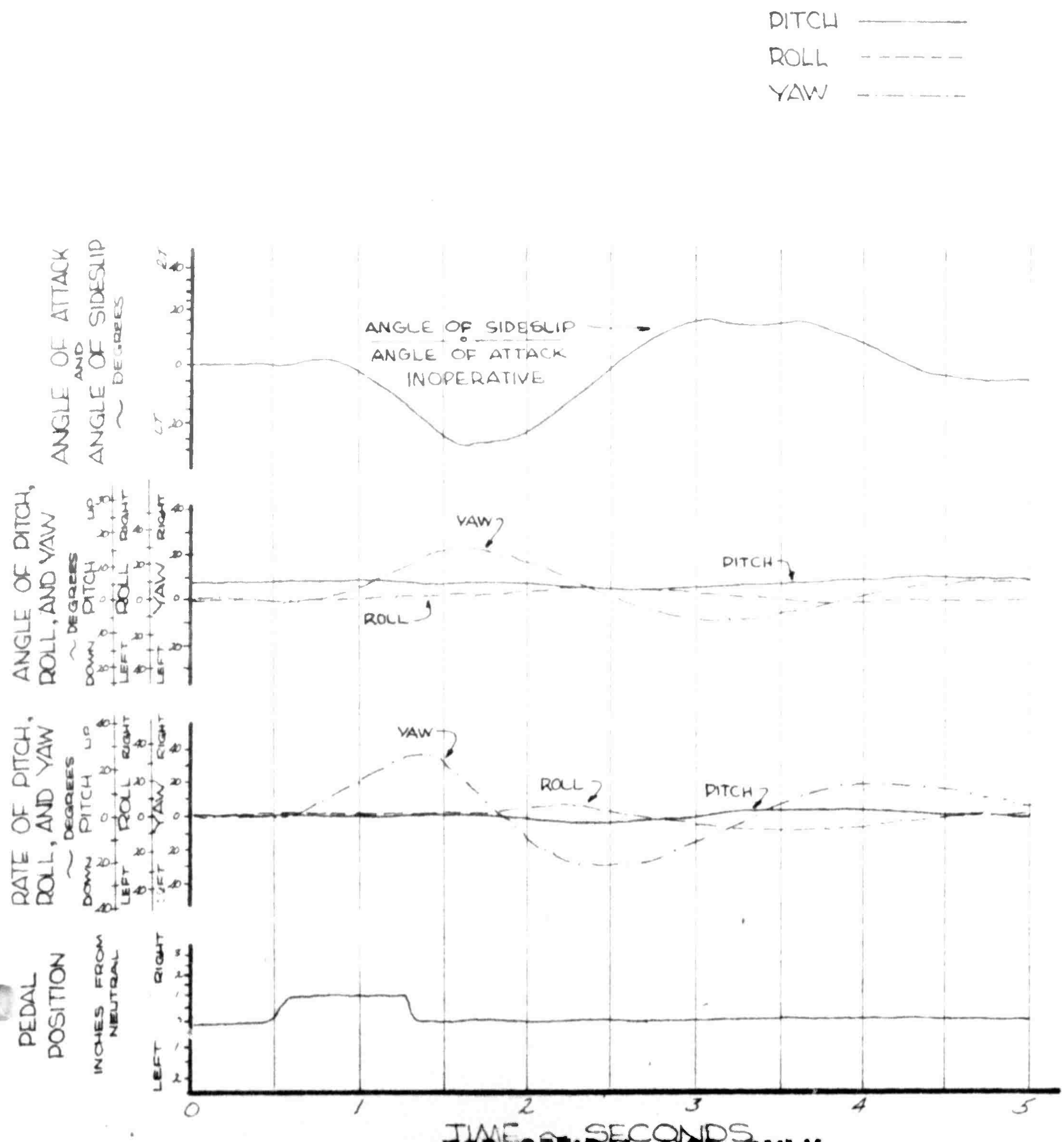
FIGURE NO. 84

RIGHT DIRECTIONAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: CLEAN
FULL PEDAL TRAVEL: ±2.6 INCHES
AVERAGE GROSS WEIGHT: 2615 LBS
LONG. C.G. LOCATION: 105.7 IN (AFT)
LATERAL C.G. LOCATION: .35 IN (RT)

FLIGHT CONDITION: CLIMB
TRIM CAS: 45 KNOTS
DENSITY ALTITUDE: 5000 FEET
ROTOR SPEED: 394 RPM
SAE CONDITION: OFF



FOR OFFICAL USE ONLY

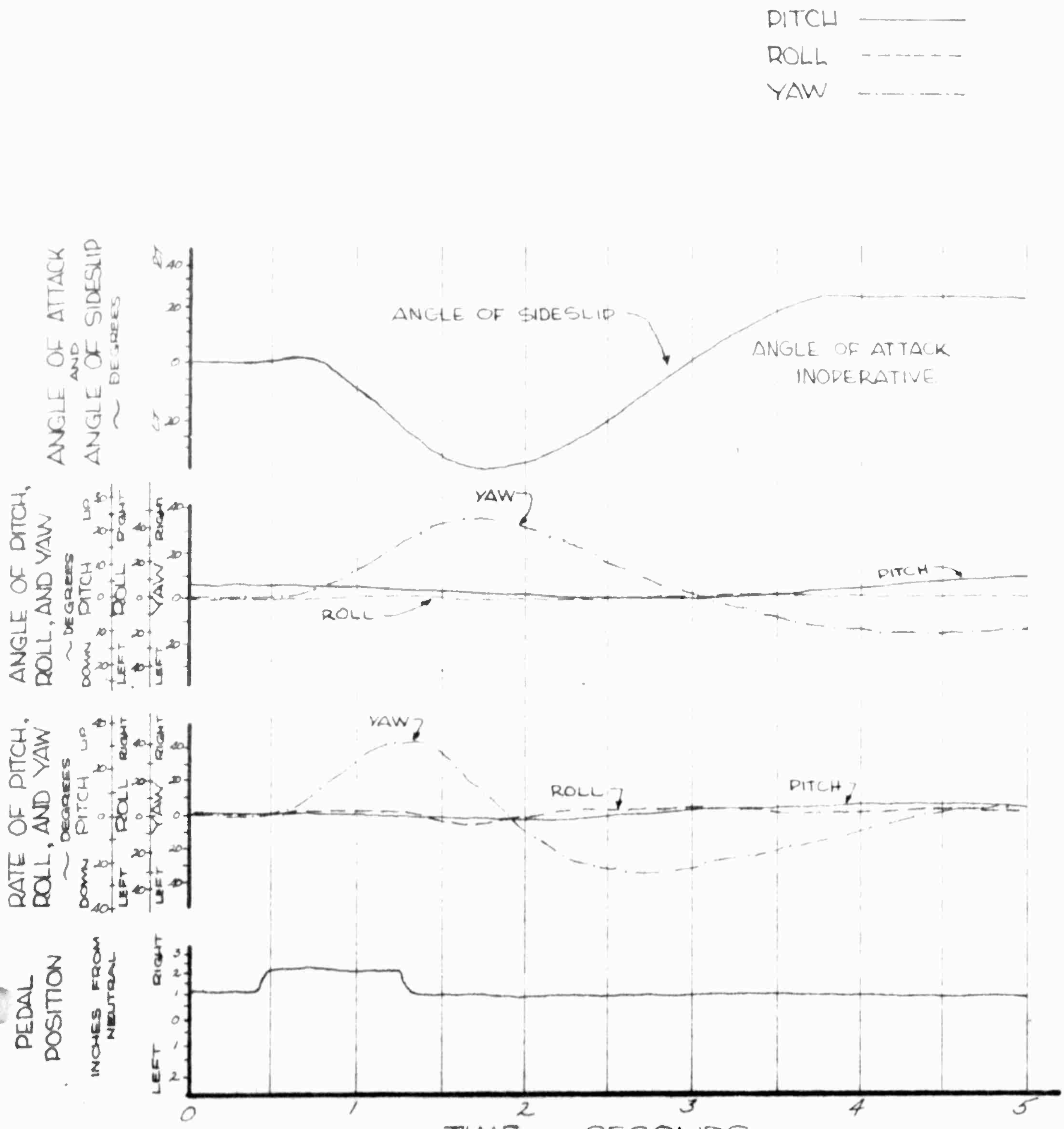
FIGURE NO. 85

RIGHT DIRECTIONAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION CLEAN
FULL PEDAL TRAVEL: ±2.6 INCHES
AVERAGE GROSS WEIGHT: 2590 LBS
LONG. C.G. LOCATION: 105.55 IN (AFT)
LATERAL C.G. LOCATION: .35 IN (RT)

FLIGHT CONDITION: AUTOROTATION
TRIM CAS: 45 KNOTS
DENSITY ALTITUDE: 5000 FEET
ROTOR SPEED: 394 RPM
SAE CONDITION: OFF



FOR OFFICAL USE ONLY

FIGURE NO. 86

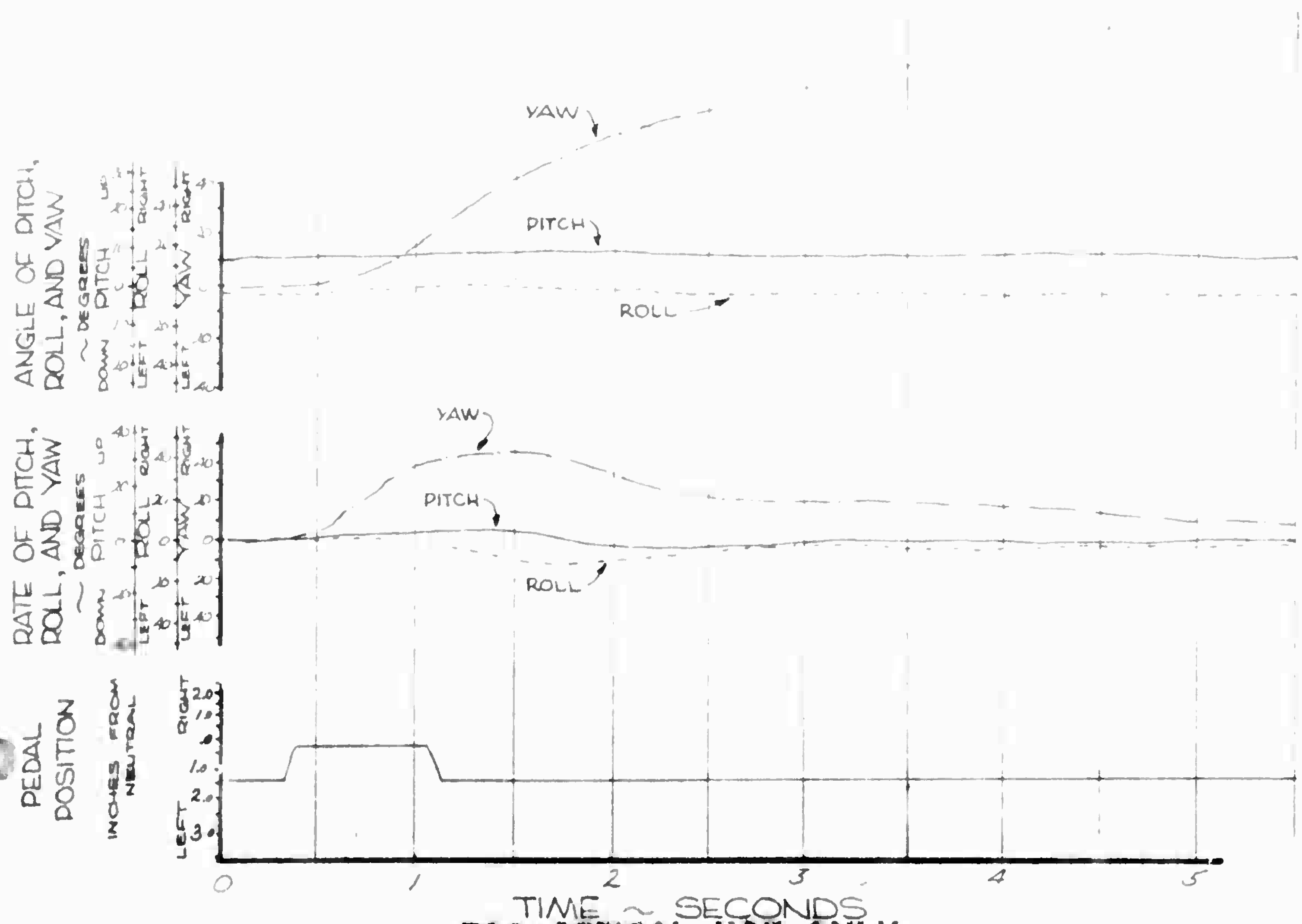
RIGHT DIRECTIONAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-7 STOWED
FULL PEDAL TRAVEL: ±2.6 INCHES
AVERAGE GROSS WEIGHT: 2650 LBS
LONG. C.G. LOCATION: 105.0 IN (AFT)
LATERAL C.G. LOCATION: 1.25 IN (LT)

FLIGHT CONDITION: HOVER (IGE)
TRIM CAS: ZERO
DENSITY ALTITUDE: 2050 FEET
ROTOR SPEED: 394 RPM
SAE CONDITION: OFF

PITCH ————
ROLL - - - - -
YAW —·—·—



FOR OFFICAL USE ONLY

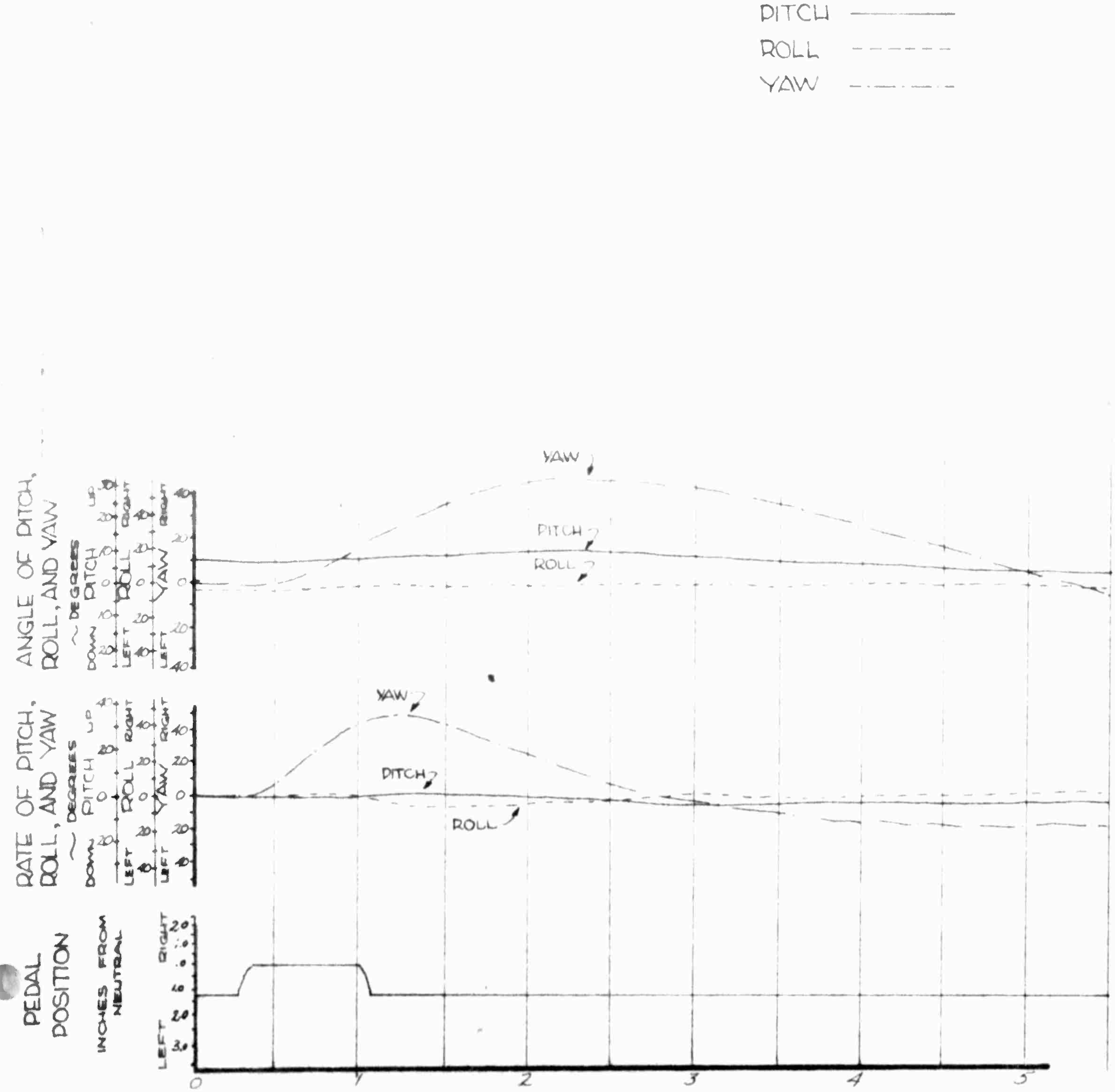
FIGURE NO. 87

RIGHT DIRECTIONAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-7 STOWED
FULL PEDAL TRAVEL: ±2.6 INCHES
AVERAGE GROSS WEIGHT: 2670 LBS
LONG. C.G. LOCATION: 105.0 IN (AFT)
LATERAL C.G. LOCATION: 1.25 IN (LT)

FLIGHT CONDITION: HOVER (IGE)
TRIM CAS: ZERO
DENSITY ALTITUDE: 2050 FEET
ROTOR SPEED: 394 RPM
SAE CONDITION: ON



FOR OFFICAL USE ONLY

FIGURE NO. 88

RIGHT DIRECTIONAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-7 STOWED
FULL PEDAL TRAVEL: ±2.6 INCHES
AVERAGE GROSS WEIGHT: 2475 LBS
LONG. C.G. LOCATION: 104.5 IN (AFT)
LATERAL C.G. LOCATION: 1.25 IN (LT)

FLIGHT CONDITION: LEVEL FLIGHT
TRIM CAS: 92 KNOTS
DENSITY ALTITUDE: 4890 FEET
ROTOR SPEED: 394 RPM
SAE CONDITION: OFF

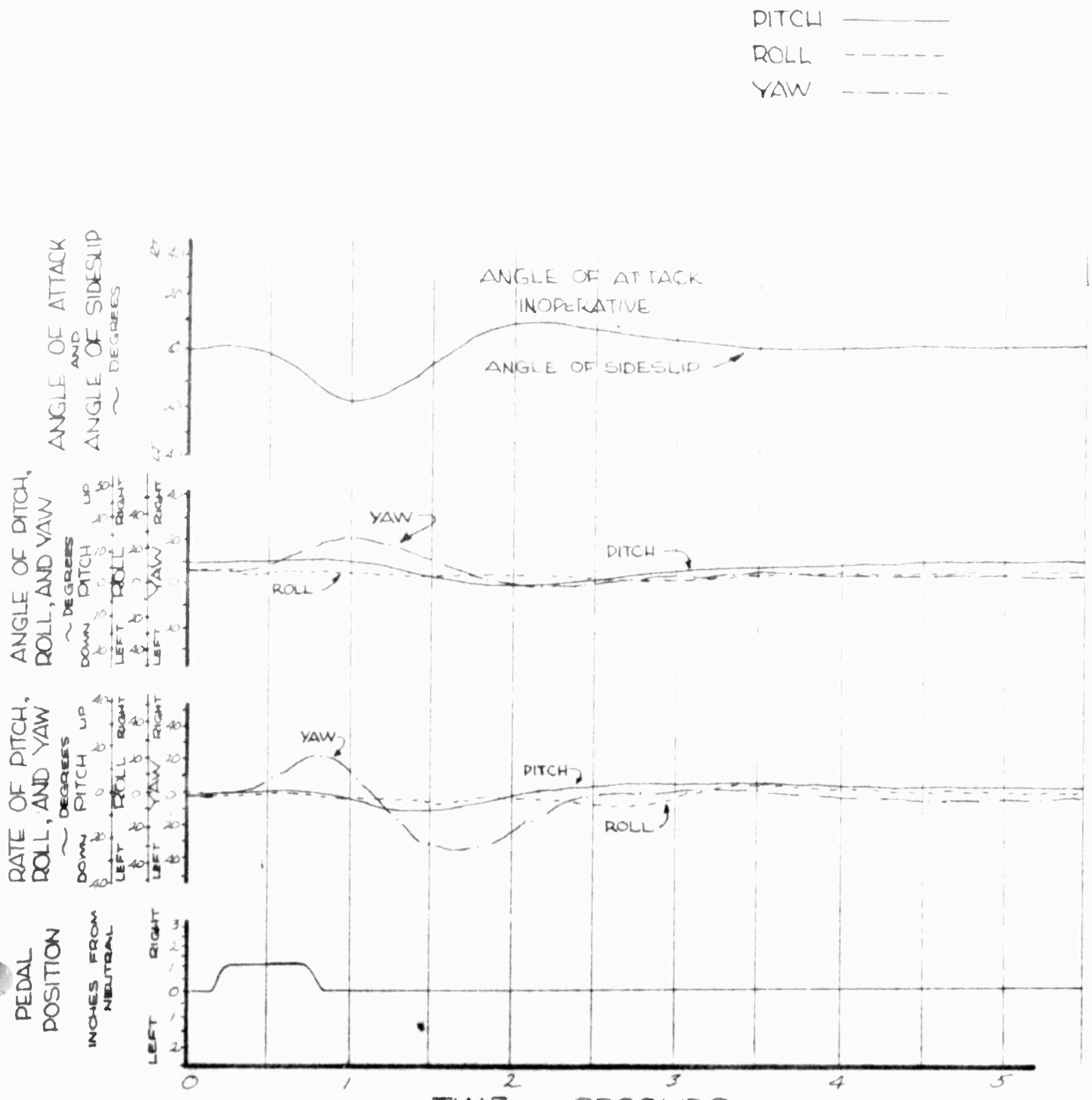


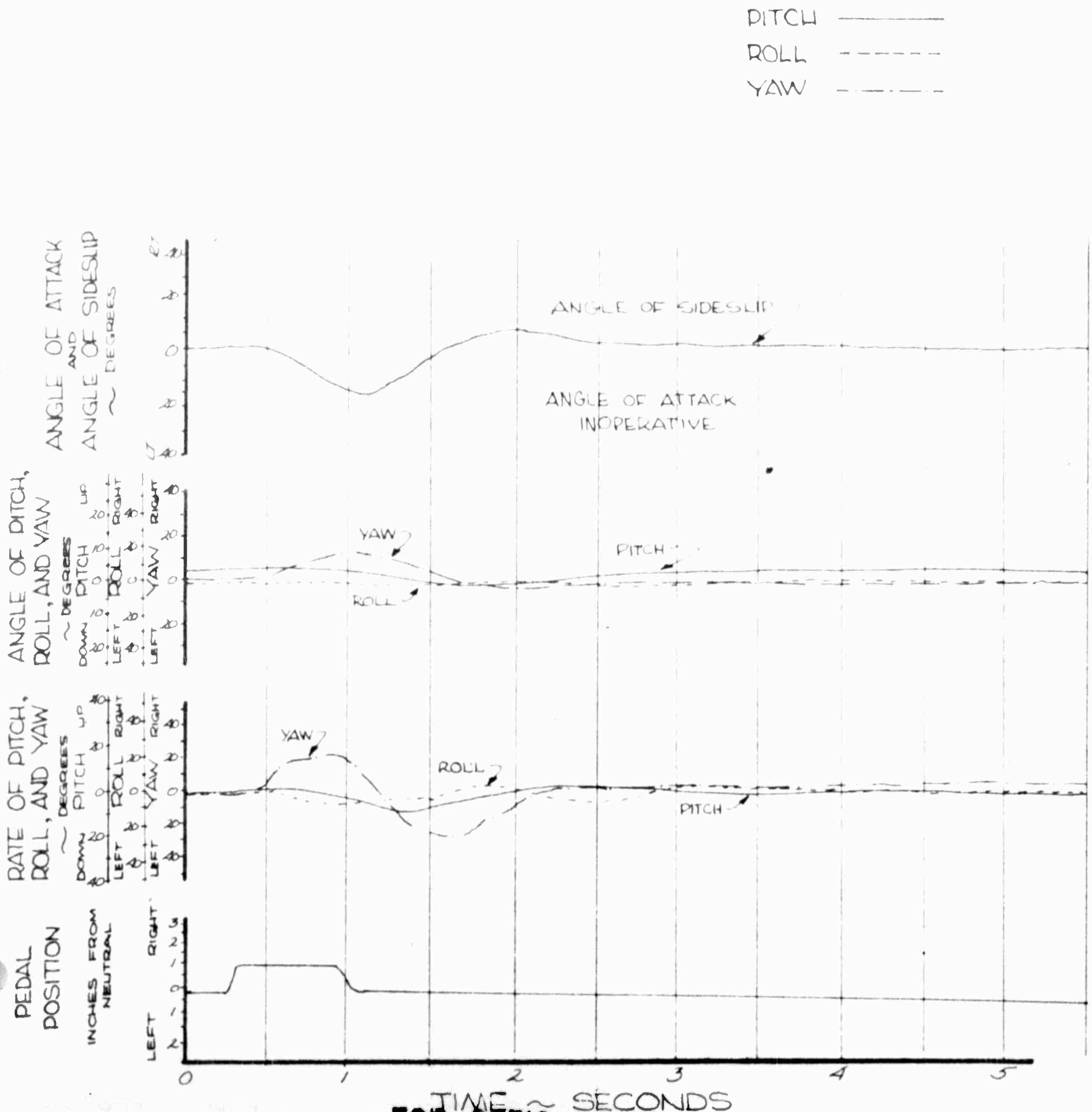
FIGURE NO. 89

RIGHT DIRECTIONAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-7 STOWED
FULL PEDAL TRAVEL: ±2.6 INCHES
AVERAGE GROSS WEIGHT: 2500 LBS
LONG. C.G. LOCATION: 104.4 IN (AFT)
LATERAL C.G. LOCATION: 1.25 IN (LT)

FLIGHT CONDITION: LEVEL FLIGHT
TRIM CAS: 92 KNOTS
DENSITY ALTITUDE: 4845 RPM
ROTOR SPEED: 394 RPM
SAE CONDITION: ON



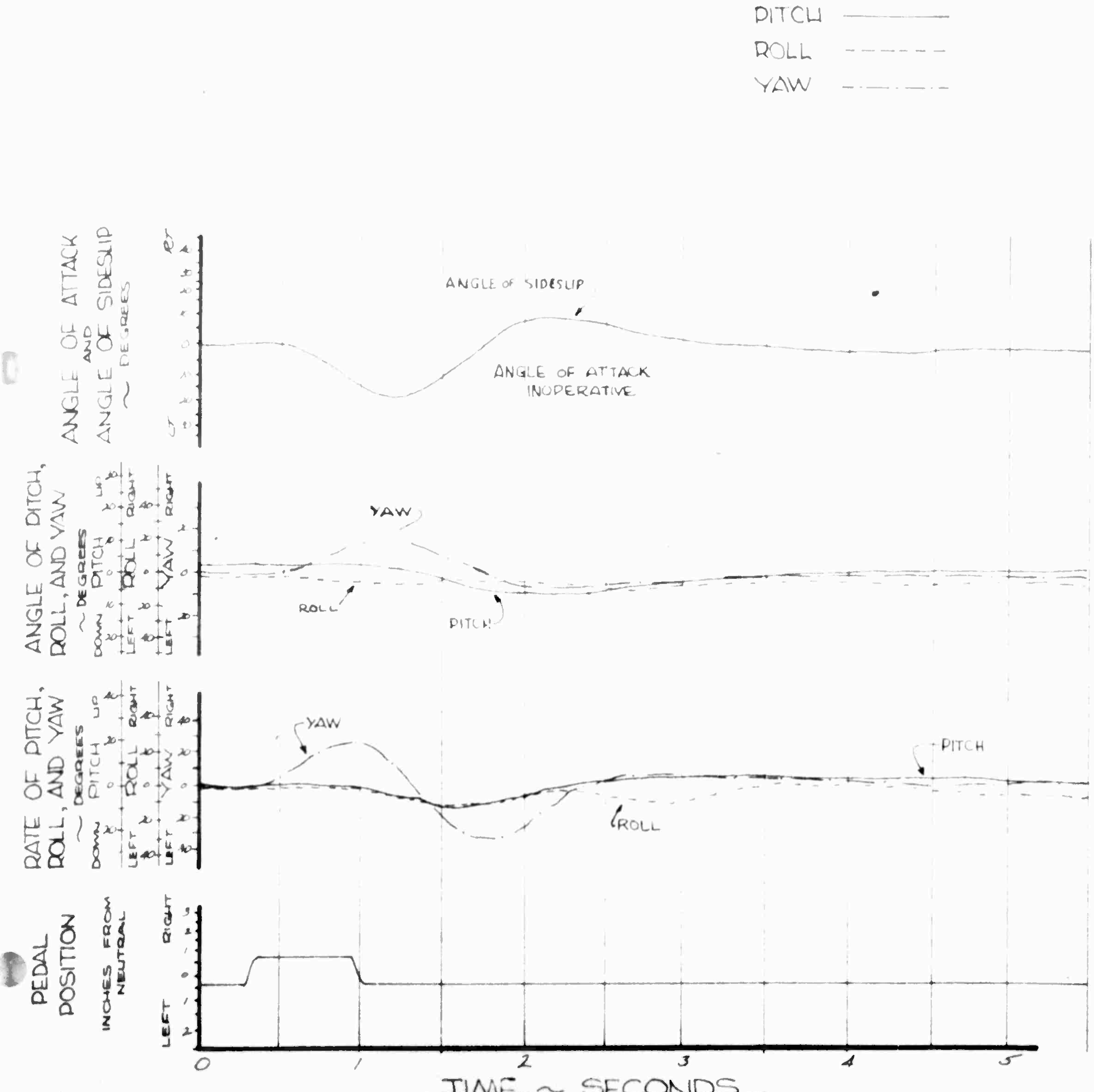
FOR OFFICAL USE ONLY

FIGURE NO. 90

RIGHT DIRECTIONAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-8 STOWED	FLIGHT CONDITION: LEVEL FLIGHT
FULL PEDAL TRAVEL: ±2.6 INCHES	TRIM CAS: 98 KNOTS
AVERAGE GROSS WEIGHT: 2480 LBS	DENSITY ALTITUDE: 4670 FEET
LONG. C.G. LOCATION: 104.95 IN (AFT)	ROTOR SPEED: 394 RPM
LATERAL C.G. LOCATION: 1.30 IN (LT)	SAE CONDITION: OFF



FOR OFFICAL USE ONLY

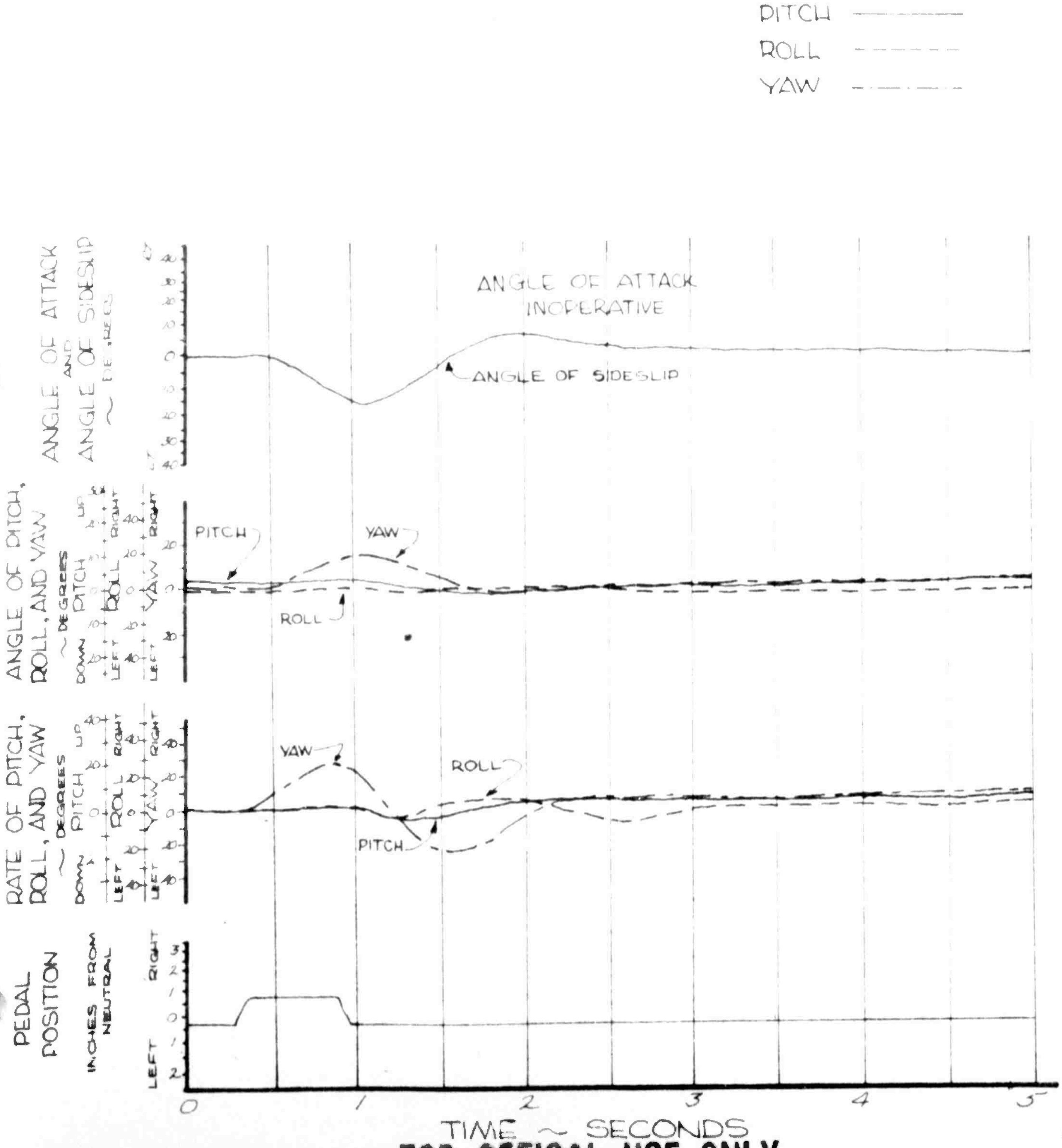
FIGURE NO. 91

RIGHT DIRECTIONAL PULSE

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-8 STOWED
FULL PEDAL TRAVEL: ±2.6 INCHES
AVERAGE GROSS WEIGHT: 2510 LBS
LONG. C.G. LOCATION: 104.95 IN (AFT)
LATERAL C.G. LOCATION: 1.30 IN (LT)

FLIGHT CONDITION: LEVEL FLIGHT
TRIM CAS: 98 KNOTS
DENSITY ALTITUDE: 4910 FEET
ROTOR SPEED: 394 RPM
SAE CONDITION: ON



FOR OFFICAL USE ONLY

FIGURE NO. 92

SUMMARY OF LONGITUDINAL CONTROL SENSITIVITY

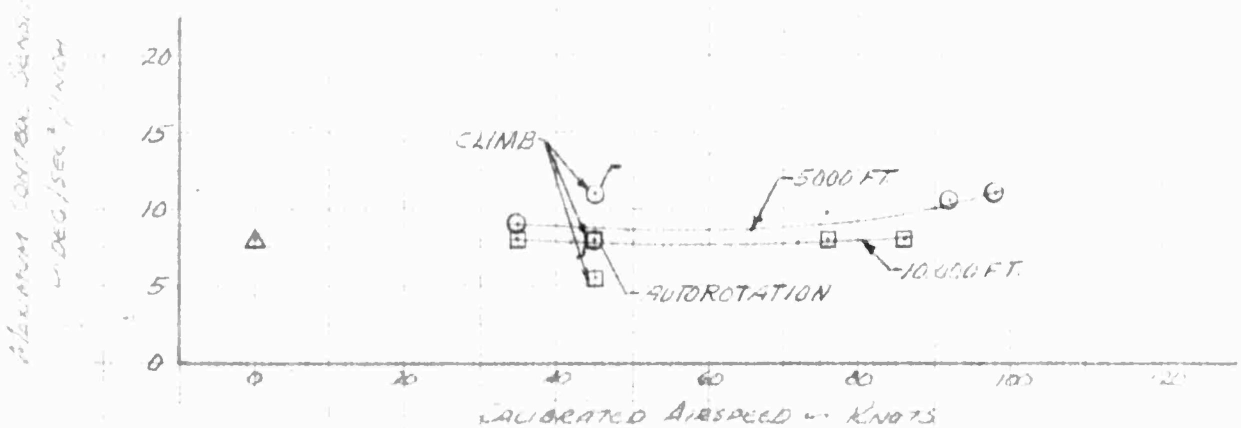
OH-4A USA S/N 62-4204

SAE-OFF

SYM	AVG H_P ~FT	AVG G.W. ~LB	AVG C.G. ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
△	780	2635	105.75	.35 RT	394	CLEAN	HOVER (IGE)
○	4755	2570	105.40	.35 RT	394	CLEAN	LEVEL FLIGHT AND NOTED
□	9450	2565	105.40 (AFT)	.35 RT	394	CLEAN	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH FORWARD AND AFT STEPS
SYMBOLS WITH FLAGS DENOTE AFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE FORWARD STEPS ONLY

POINTS DERIVED FROM FIGURE NO 94, 96, AND 97.



SYM	AVG H_P ~FT	AVG G.W. ~LB	AVG C.G. ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
□	950	2920	105.05	.75 LT	394	CLEAN	HOVER (IGE)
△	5160	2875	104.85 (AFT)	.75 LT	394	CLEAN	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH FORWARD AND AFT STEPS
SYMBOLS WITH FLAGS DENOTE AFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE FORWARD STEPS ONLY

POINTS DERIVED FROM FIGURE NO. 95 AND 97.

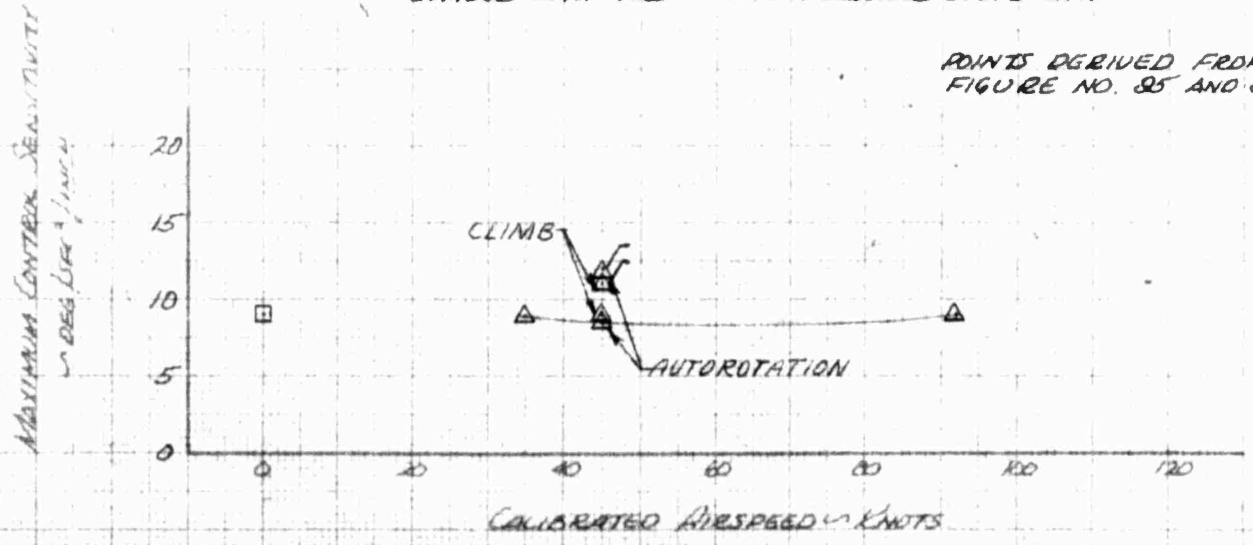
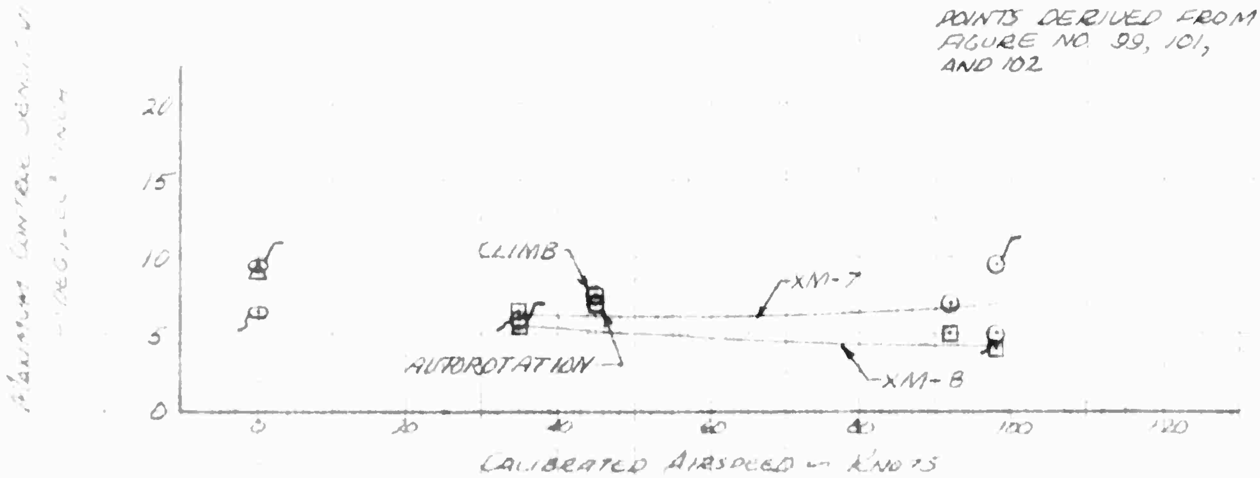


FIGURE NO. 93

SUMMARY OF LONGITUDINAL CONTROL SENSITIVITY
OH-4A USA S/N 62-4204

SYM	AVG HD ~ FT	AVG G.W. ~ LB	AVG C.G. ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
△	590	2675	105.05	1.25 LT	394	XM-7 SAE ON	HOVER (IGE)
⬭	390	2650	105.40	1.30 LT	394	XM-8 SAE ON	HOVER (IGE)
○	4985	2555	104.50	1.25 LT	394	XM-7 SAE ON	LEVEL FLIGHT AND NOTED
□	4960	2560	105.05 (AFT)	1.30 LT	394	XM-8 SAE ON	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH FORWARD AND AFT STEPS
SYMBOLS WITH FLAGS DENOTE AFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE FORWARD STEPS ONLY



SYM	AVG HD ~ FT	AVG G.W. ~ LB	AVG C.G. ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
⬭	535	2650	104.95	1.25 LT	394	XM-7 SAE OFF	HOVER (IGE)
□	300	2640	105.40	1.30 LT	394	XM-8 SAE OFF	HOVER (IGE)
△	4910	2570	104.55	1.25 LT	394	XM-7 SAE OFF	LEVEL FLIGHT AND NOTED
○	4850	2600	105.20 (AFT)	1.30 LT	394	XM-8 SAE OFF	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH FORWARD AND AFT STEPS
SYMBOLS WITH FLAGS DENOTE AFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE FORWARD STEPS ONLY

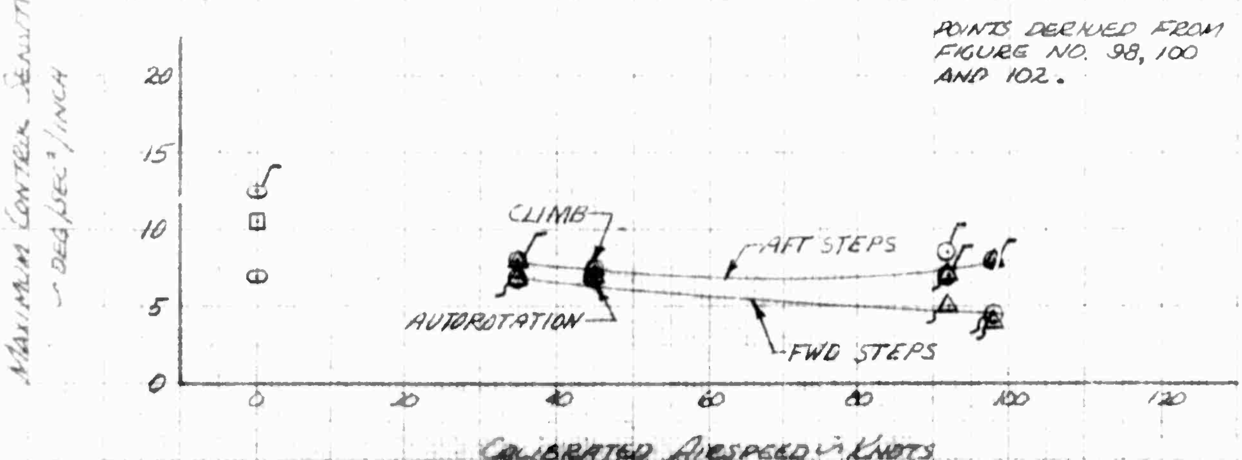


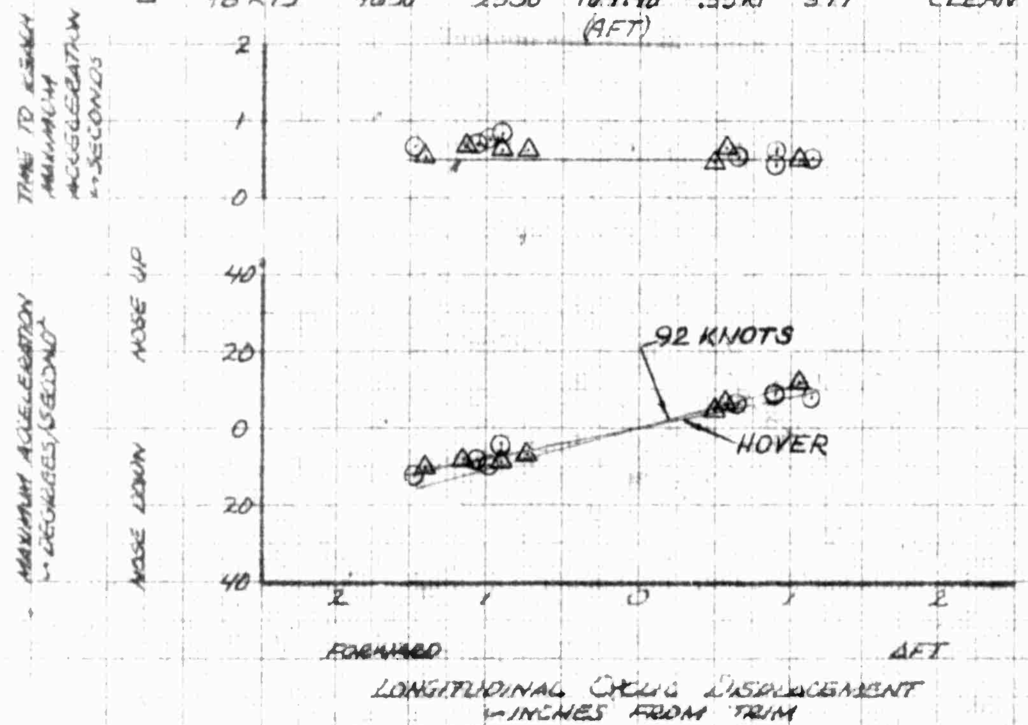
FIGURE NO. 94

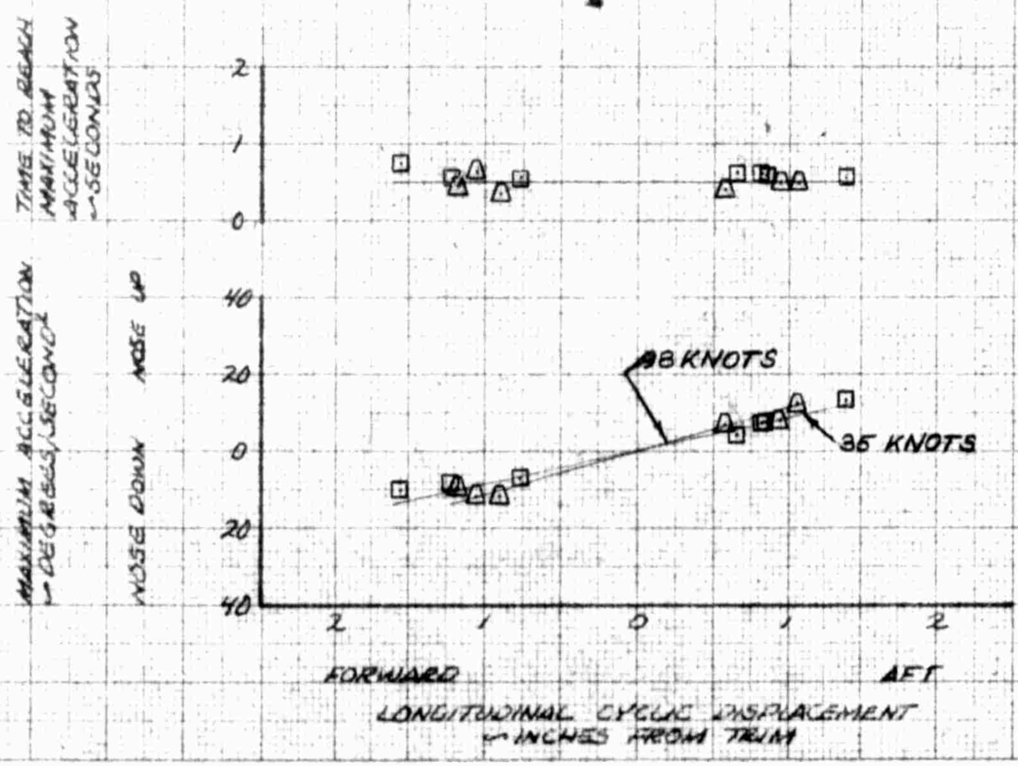
LONGITUDINAL CONTROL SENSITIVITY

OH-6A USA S/N 62-4204

SAE OFF

SYM	AIRSPEED ~KCAS	AVG H_O ~FT	AVG G.W. ~LB	AVG CG ~IN LONG	AVG CG ~IN LAT	ROTOR RPM	CONFIGURATION	FLT. COND.
○	ZERO	780	2635	105.75	.35 RT	394	CLEAN	HOVER (IGE)
□	35 KTS	4940	2570	105.60	.35 RT	394	CLEAN	LEVEL FLIGHT
△	92 KTS	4190	2545	105.45	.36 RT	394	CLEAN	LEVEL FLIGHT
△	98 KTS	4650	2530	104.40 (AFT)	.35 RT	394	CLEAN	LEVEL FLIGHT



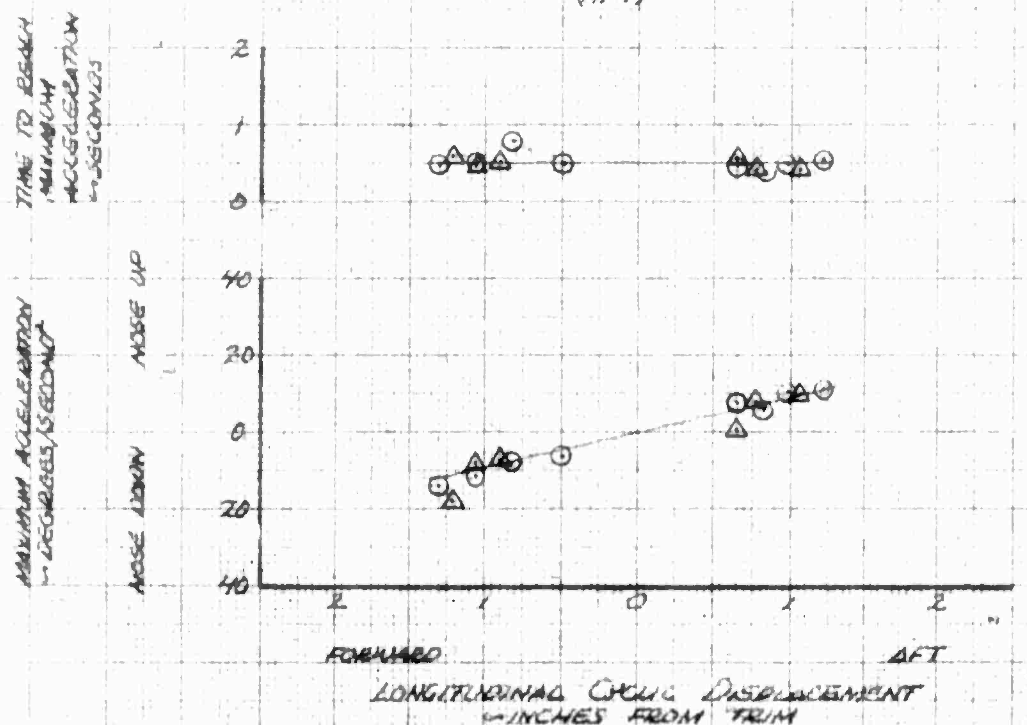


LONGITUDINAL CONTROL SENSITIVITY

CH-4A USA S/N 62-4204

SAE OFF

SYM	AVG AIRSPEED ~KCAS	AVG H_p ~FT	AVG GW ~LB	AVG CG ~IN LONG	AVG CG ~IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	950	2920	105.05	.35RT	394	CLEAN	HOVER (IGE)
□	35 KTS	5220	2855	104.85	.35RT	394	CLEAN	LEVEL FLIGHT
△	92 KTS	5410	2825	104.70 (AFT)	.35RT	394	CLEAN	LEVEL FLIGHT



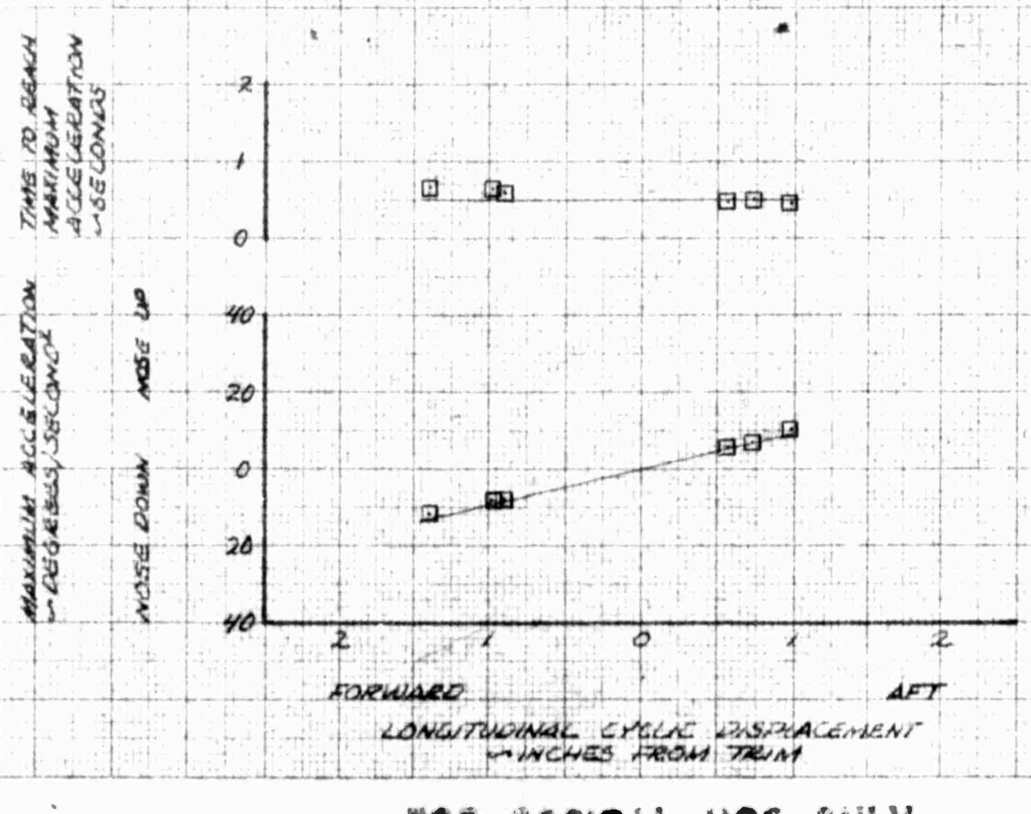


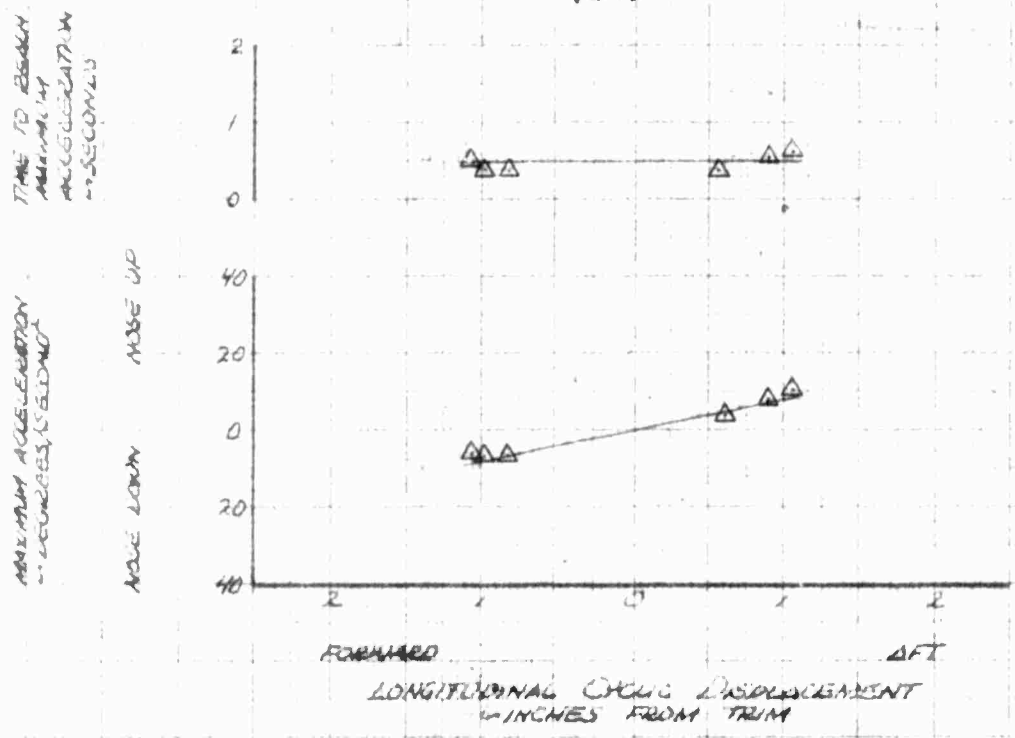
FIGURE NO 96

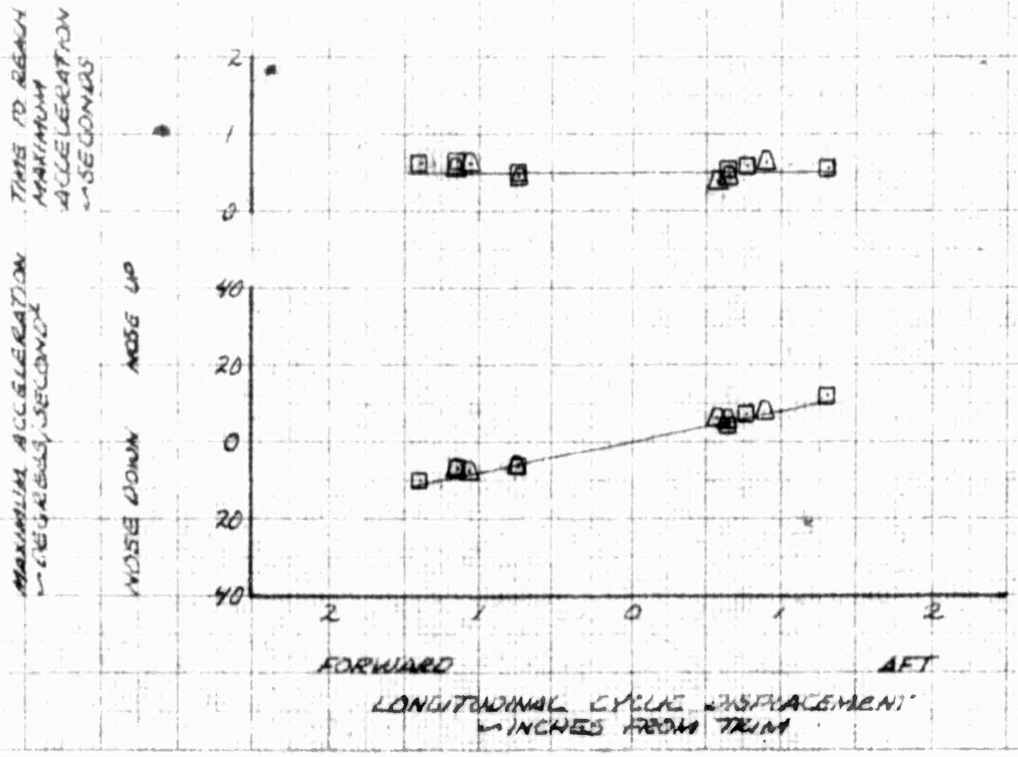
LONGITUDINAL CONTROL SENSITIVITY

CH-4A USA S/N 62-4204

SAE OFF

SYM	AIRSPEED ~KCAS	AVG H_C ~FT	AVG G.W. ~LB	AVG C.G. ~IN LONG	AVG C.G. ~IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	35 KTS	9465	2565	105.55	.35 RT	394	CLEAN	LEVEL FLIGHT
△	76 KTS	10090	2550	105.45	.35 RT	394	CLEAN	LEVEL FLIGHT
△	86 KTS	10200	2530	104.40 (AFT)	.35 RT	394	CLEAN	LEVEL FLIGHT





FOR OFFICAL USE ONLY

FIGURE NO 97

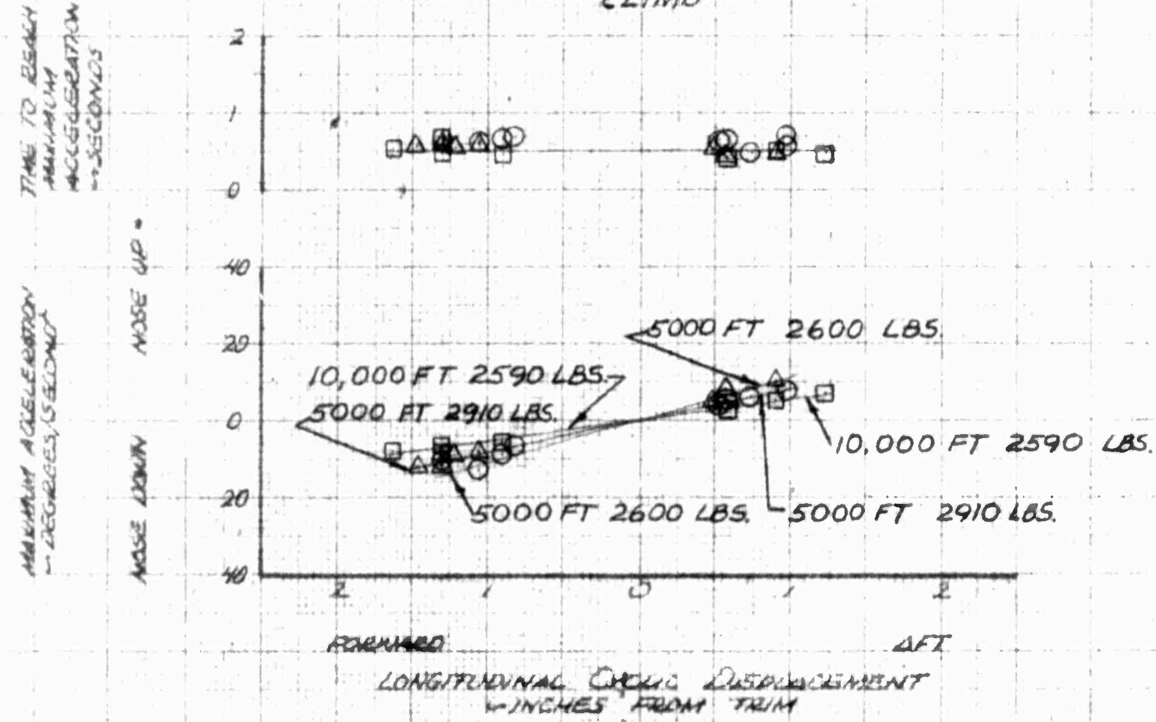
LONGITUDINAL CONTROL SENSITIVITY

CH-4A USA S/N 62-4204

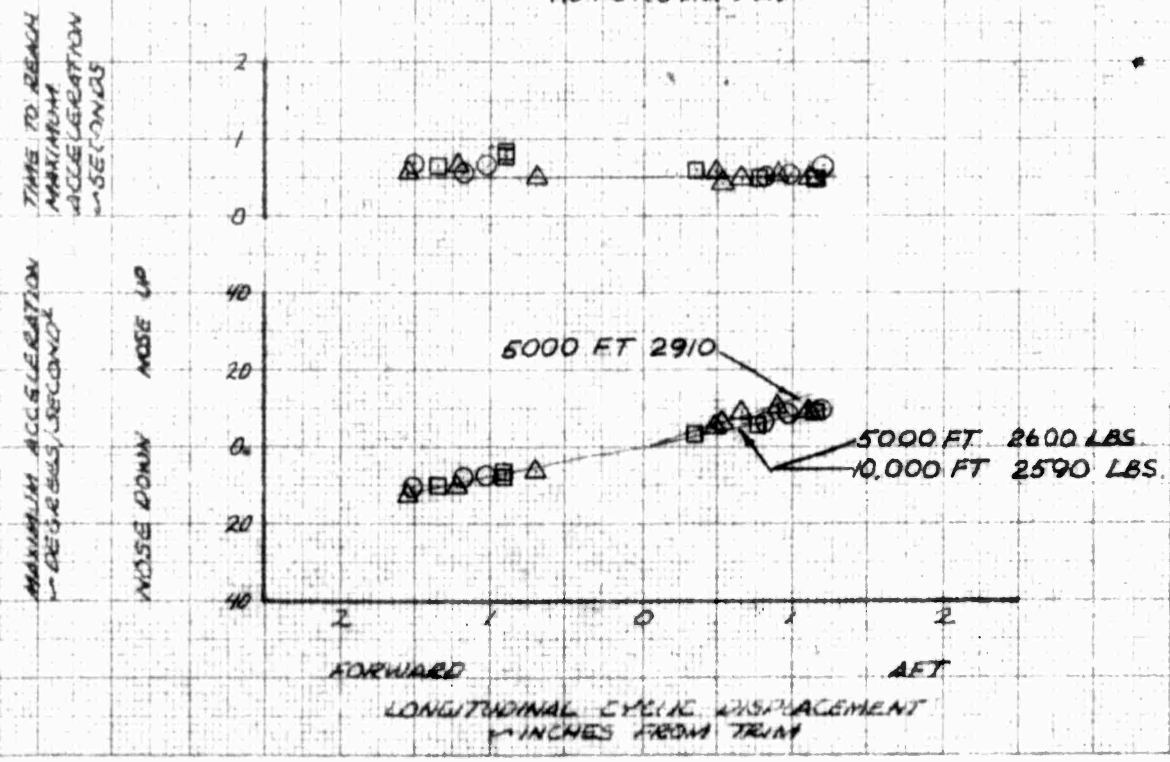
SAE OFF

SYM	AIRSPEED ~CAS	AVG Hp ~FT	AVG G.W. ~LB	AVG CG ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT. COND.
○	45 KTS	5000	2600	105.70	.35 RT	394	CLEAN	NOTED
□	45 KTS	10000	2590	105.78	.35 RT	394	CLEAN	NOTED
△	45 KTS	5000	2910	105.18 (AFT)	.75 LT	394	CLEAN	NOTED

CLIMB



AUTOROTATION



FOR OFFICAL USE ONLY

FIGURE NO 98
LONGITUDINAL CONTROL SENSITIVITY
OH-4A USA S/N 62-4204
SAE OFF

SYM	AIRSPEED ~CAS	AVG Hd ~FT	AVG G.W. ~LB	AVG CG ~IN LONG	AVG CG ~IN LAT	ROTOR RPM	CONFIGURATION	FLT COND.
○	ZERO	535	2650	104.95	1.25LT	394	XM-7	HOVER (IGE)
□	35KTS	4600	2540	104.50	1.25LT	394	XM-7	LEVEL FLIGHT
△	92KTS	4995	2495	104.40	1.25LT	394	XM-7	LEVEL FLIGHT
⌂	98KTS	3950	2650	104.95 (AFT)	1.25LT	394	XM-7	LEVEL FLIGHT

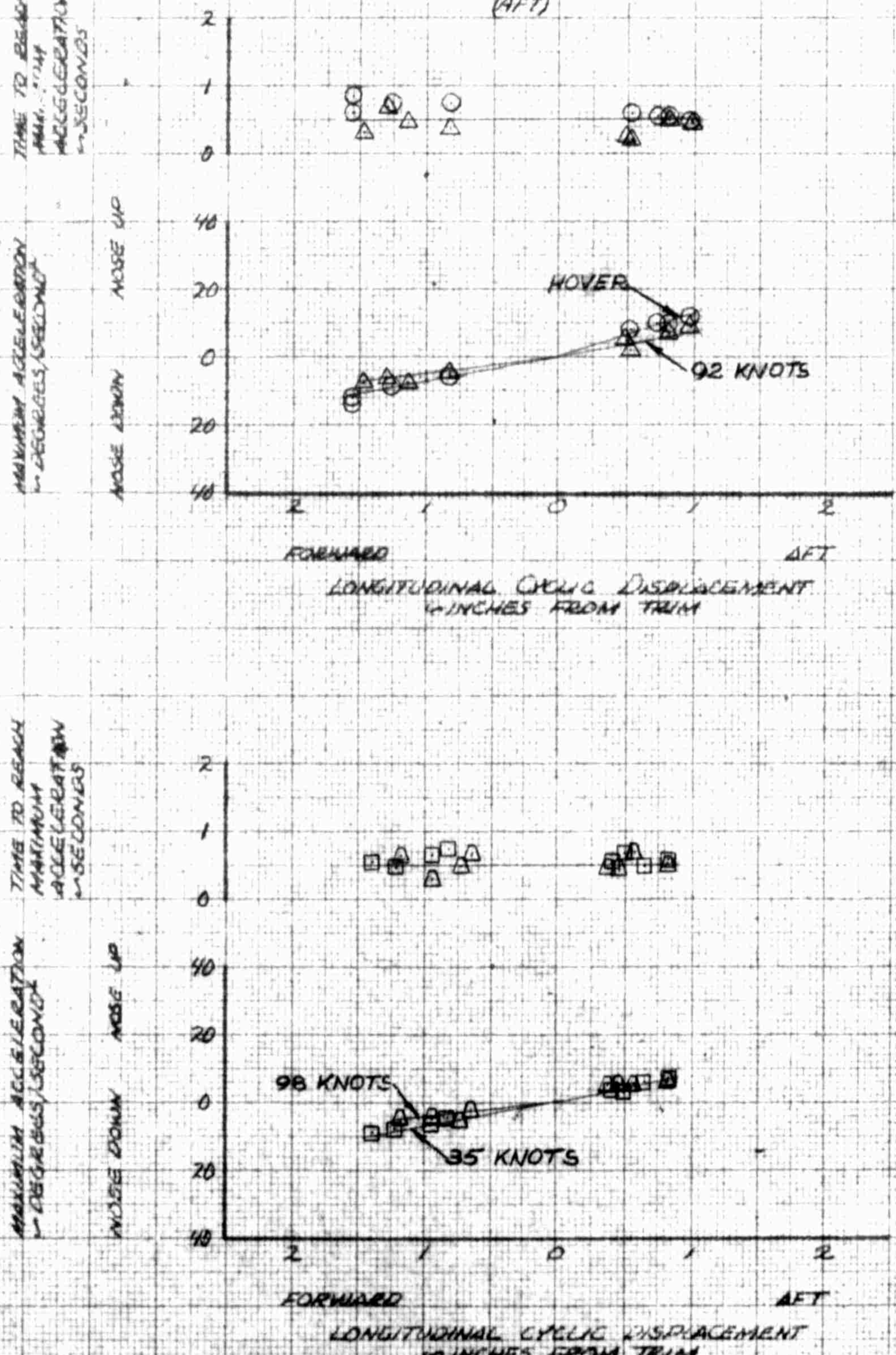
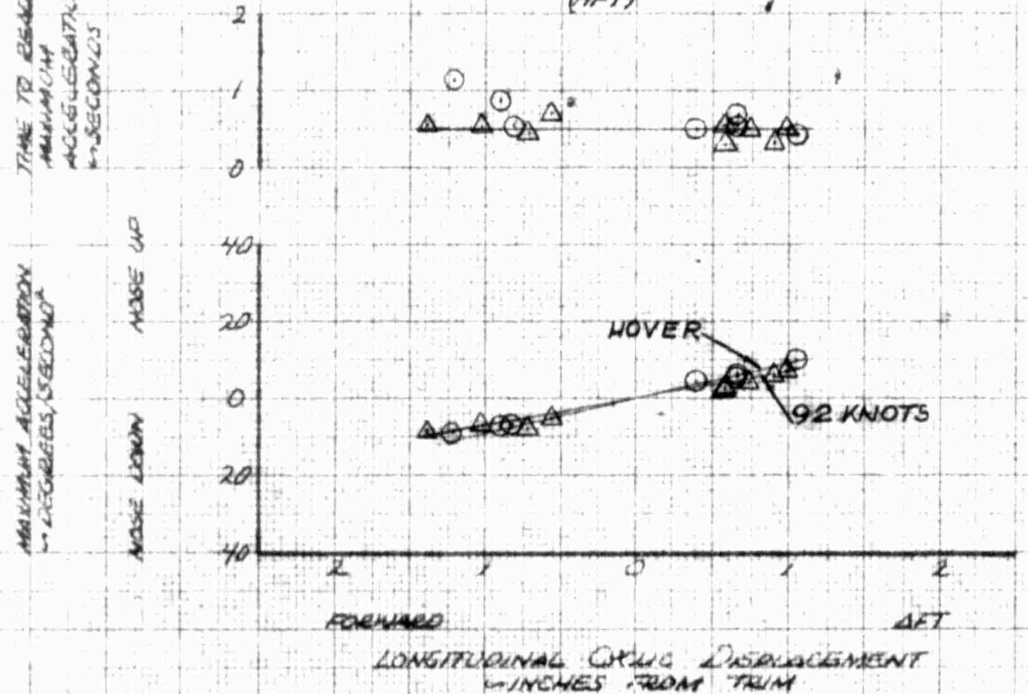


FIGURE NO 99
LONGITUDINAL CONTROL SENSITIVITY
CH-4A USA S/N 62-4204
SAE ON

SYM	AIRSPEED ~CAS	AVG Hd ~FT	AVG GW ~LB	AVG CG ~IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	590	2675	105.05	1.25LT	394	XM-7	HOVER (IGE)
□	35 KTS	4785	2575	104.60	1.25LT	394	XM-7	LEVEL FLIGHT
△	92 KTS	5230	2545	104.50	1.25LT	394	XM-7	LEVEL FLIGHT
△	98 KTS	4910	2520	104.90 (AFT)	1.25LT	394	XM-7	LEVEL FLIGHT



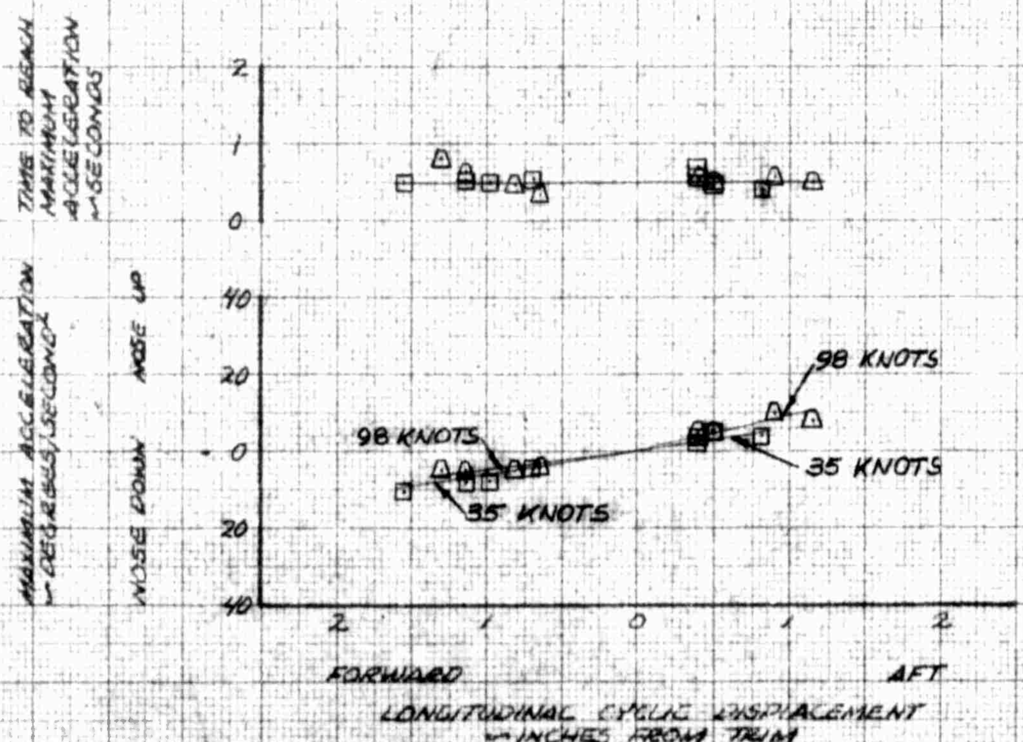


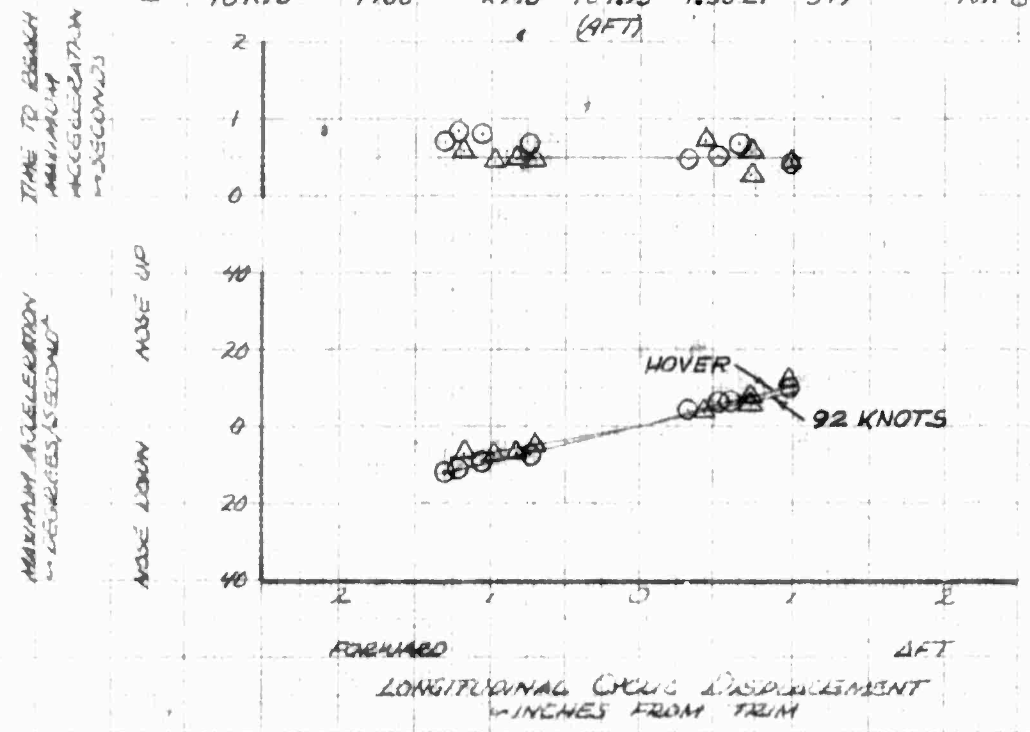
FIGURE NO 100

LONGITUDINAL CONTROL SENSITIVITY

OH-4A USA S/N 62-4204

SAE OFF

SYM	AIRSPEED ~KCAS	AVG H_p ~FT	AVG G.W ~LB	AVG CG ~IN LONG	AVG CG ~IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	300	2690	105.40	1.30 LT	394	XM-8	HOVER (IGE)
□	35 KTS	4730	2605	104.95	1.30 LT	394	XM-8	LEVEL FLIGHT
△	92 KTS	4630	2580	104.85	1.30 LT	394	XM-8	LEVEL FLIGHT
△	98 KTS	4900	2495	104.95 (AFT)	1.30 LT	394	XM-8	LEVEL FLIGHT



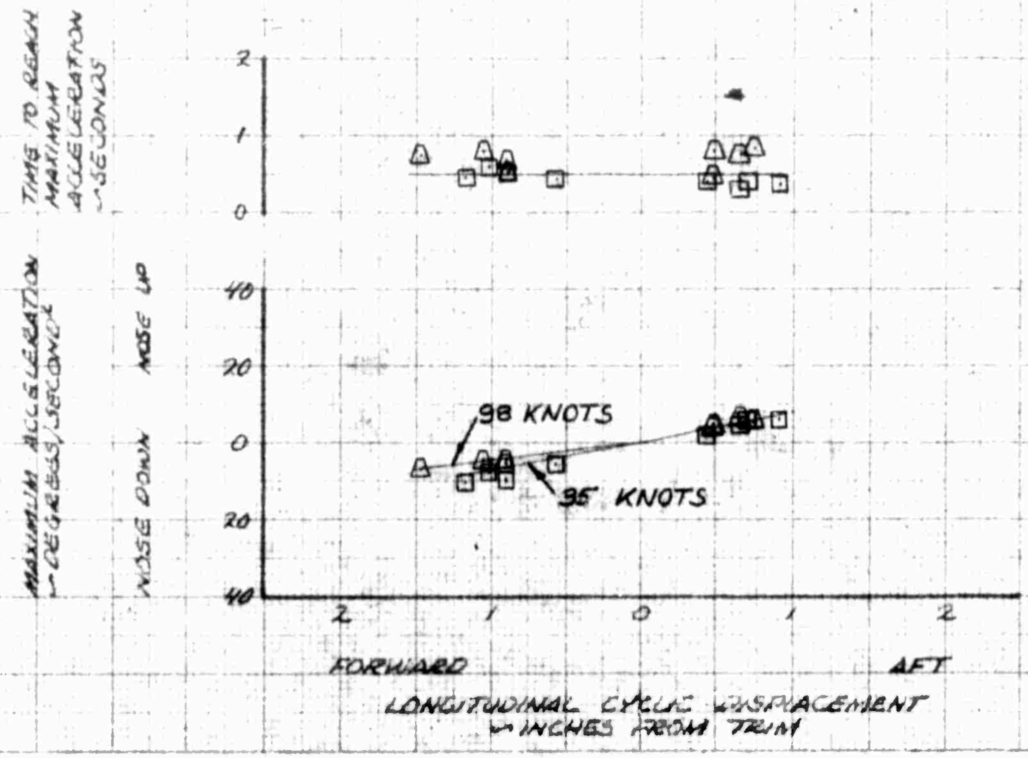


FIGURE No 101
LONGITUDINAL CONTROL SENSITIVITY
CH-4A USA S/N 62-4204
SAE ON

SYM	AIRSPEED ~KCAS	AVG H_p ~FT	AVG G.W ~LB	AVG CG ~IN LONG	AVG CG ~IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	390	2650	105.30	1.30 LT	394	XM-B	HOVER (IGE)
□	35 KTS	4885	2555	105.05	1.30 LT	394	XM-B	LEVEL FLIGHT
△	92 KTS	4900	2535	105.00	1.30 LT	394	XM-B	LEVEL FLIGHT
△	98 KTS	5020	2515	104.95 (AFT)	1.30 LT	394	XM-B	LEVEL FLIGHT

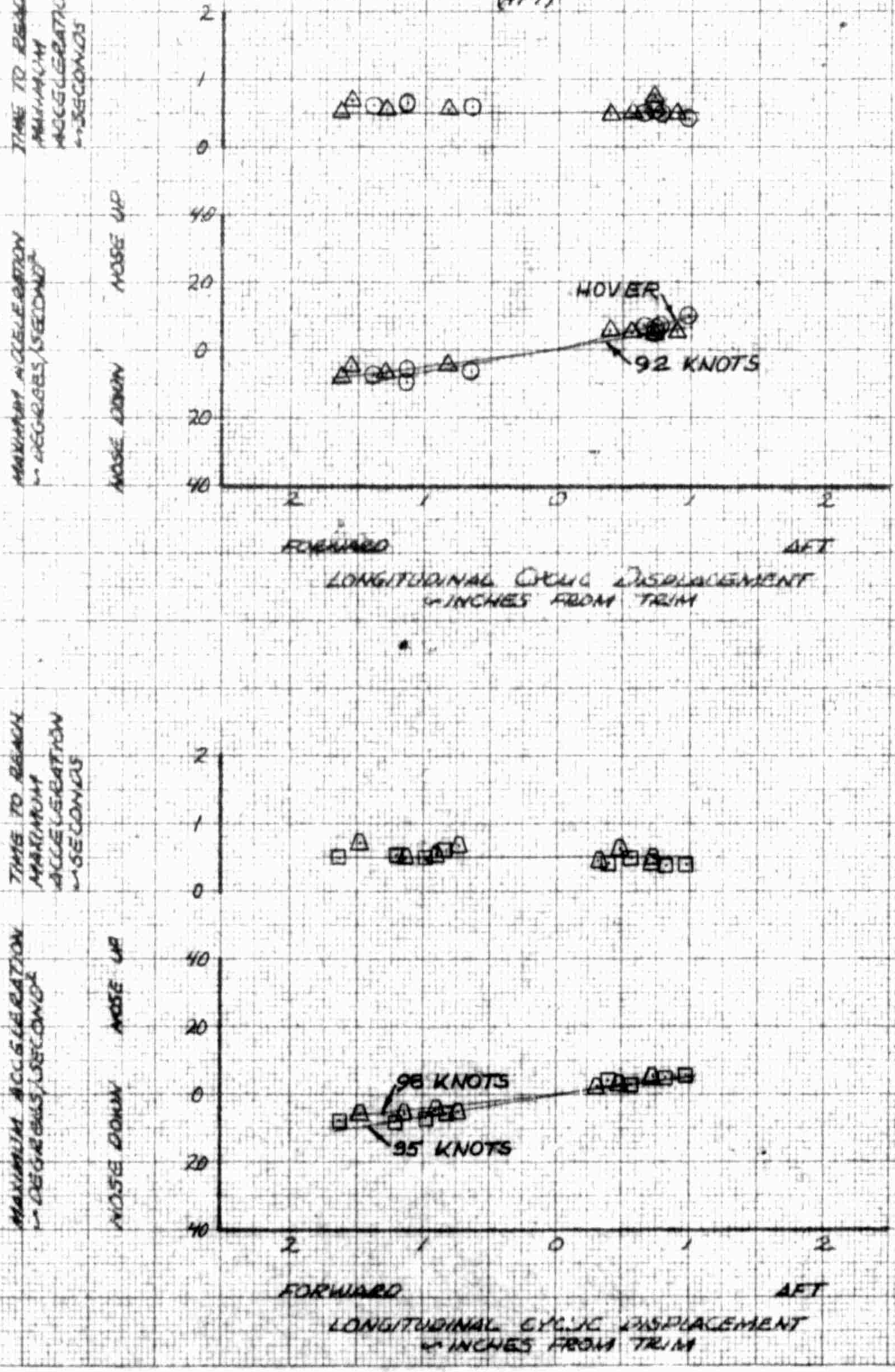
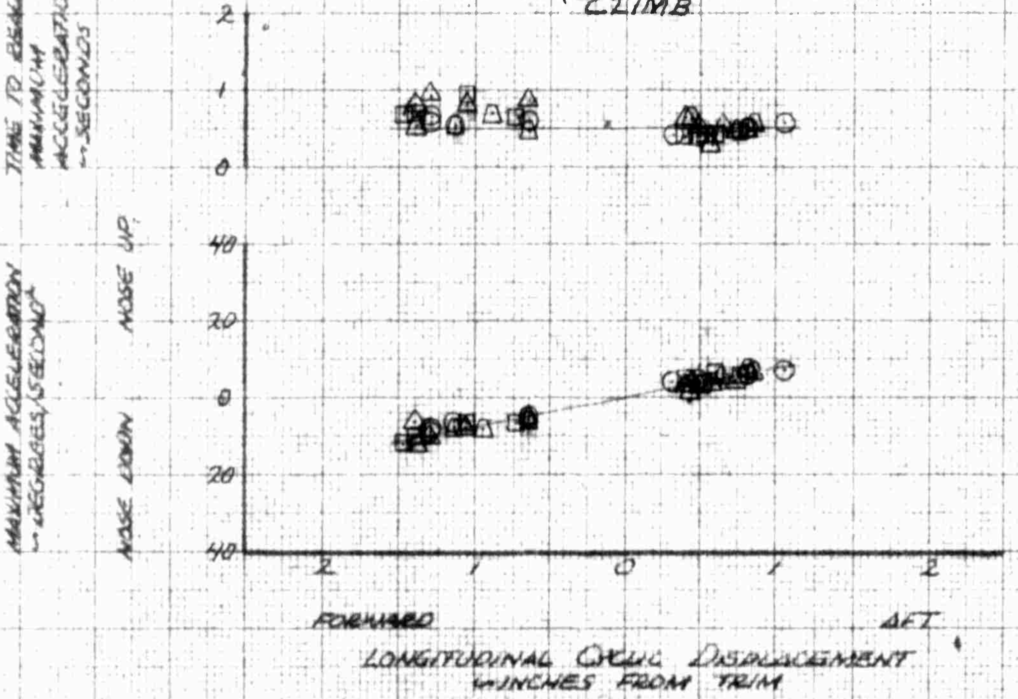
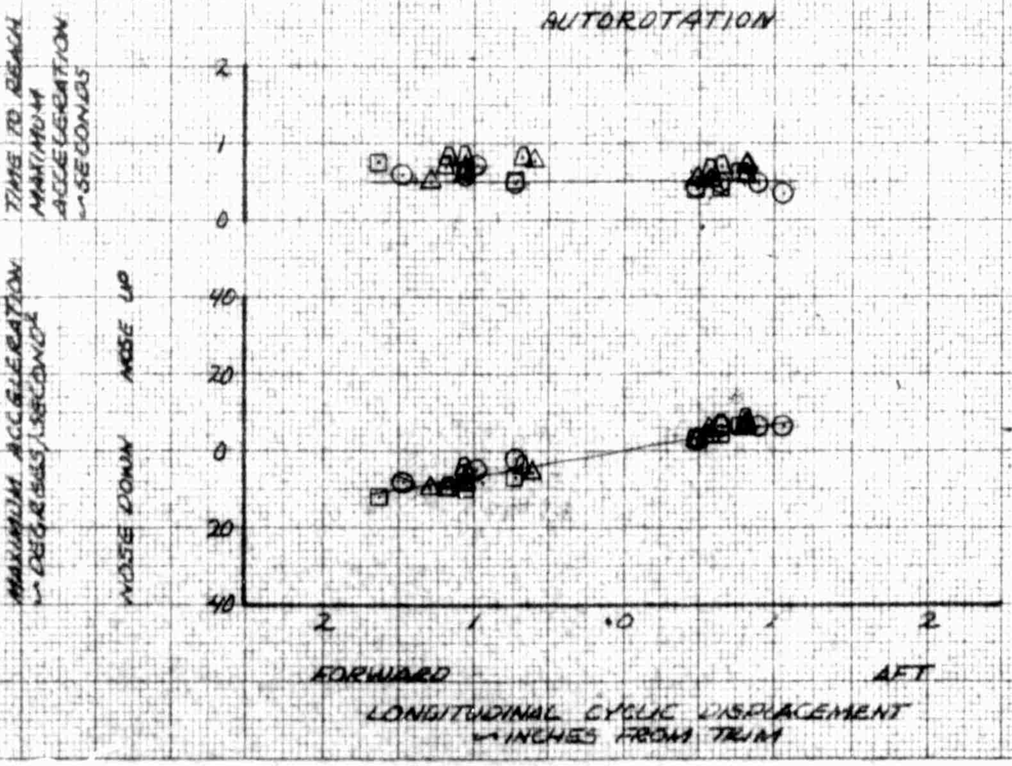


FIGURE NO 102
LONGITUDINAL CONTROL SENSITIVITY
OH-4A USA S/N 62-4204

SYM	AIRSPEED ~KCAS	AVG Hp ~FT	AVG G.W. ~LB	AVG CG ~IN LONG	AVG CG ~IN LAT	ROTOR RPM	CONFIGURATION		FLT. COND.
○	45 KTS	5000	2600	105.20	1.30 LT	394	XM-8	SAE ON	NOTED
□	45 KTS	5000	2665	105.20	1.30 LT	394	XM-8	SAE OFF	NOTED
△	45 KTS	5000	2620	104.60	1.25 LT	394	XM-7	SAE ON	NOTED
△	45 KTS	5000	2585	104.60 (AFT)	1.25 LT	394	XM-7	SAE OFF	NOTED





FOR OFFICAL USE ONLY

FIGURE NO: 103

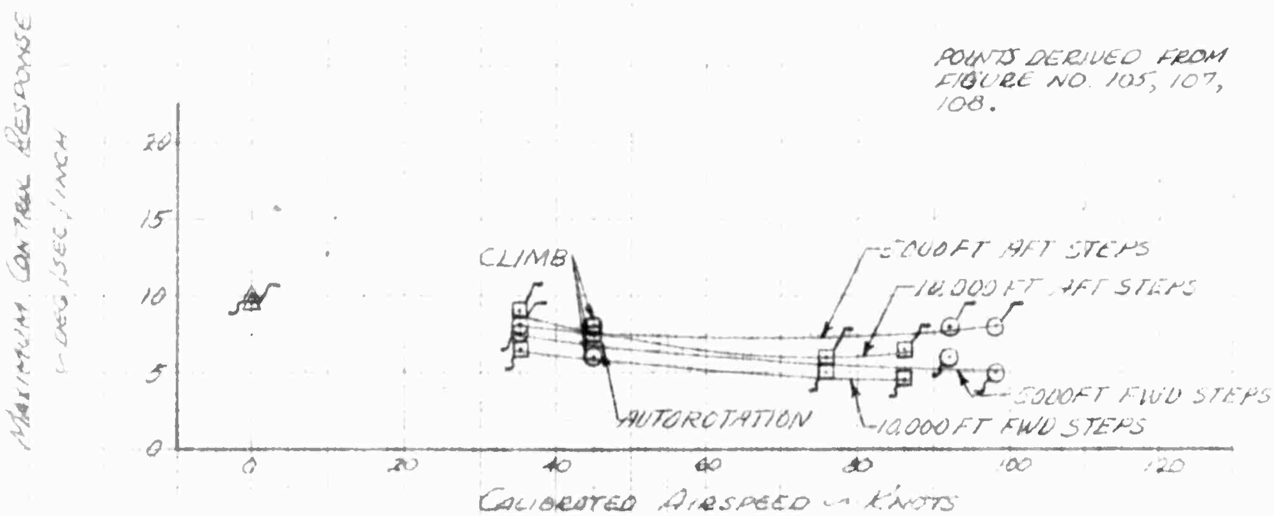
SUMMARY OF LONGITUDINAL CONTROL RESPONSE

OH 4A USA S/N 62-4204

SAE OFF

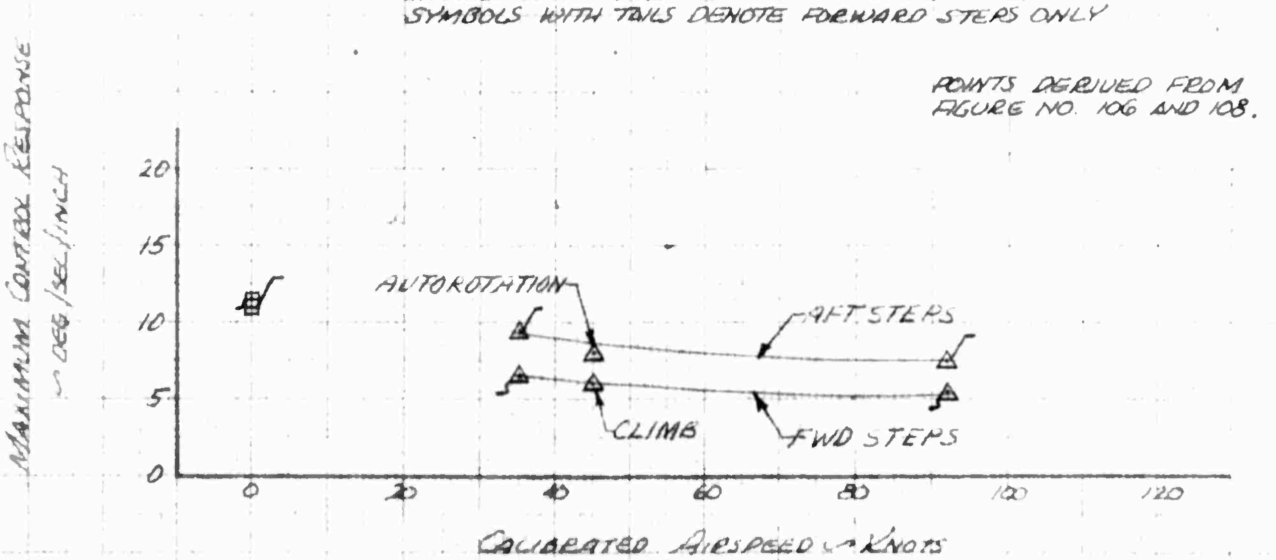
SYM	AVG H_P ~FT	AVG GW ~LB	AVG CG ~ IN LONG	AVG CG ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
△	780	2635	105.75	.35 RT	394	CLEAN	HOVER (IGE)
○	4755	2570	105.40	.35 RT	394	CLEAN	LEVEL FLIGHT AND NOTED
□	9950	2565	105.40 (AFT)	.35 RT	394	CLEAN	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH FORWARD AND AFT STEPS
SYMBOLS WITH FLAGS DENOTE AFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE FORWARD STEPS ONLY



SYM	AVG H_P ~FT	AVG GW ~LB	AVG CG ~ IN LONG	AVG CG ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
□	950	2920	105.05	.75 LT	394	CLEAN	HOVER (IGE)
△	5160	2875	104.85 (AFT)	.75 LT	394	CLEAN	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH FORWARD AND AFT STEPS
SYMBOLS WITH FLAGS DENOTE AFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE FORWARD STEPS ONLY



FOR OFFICAL USE ONLY

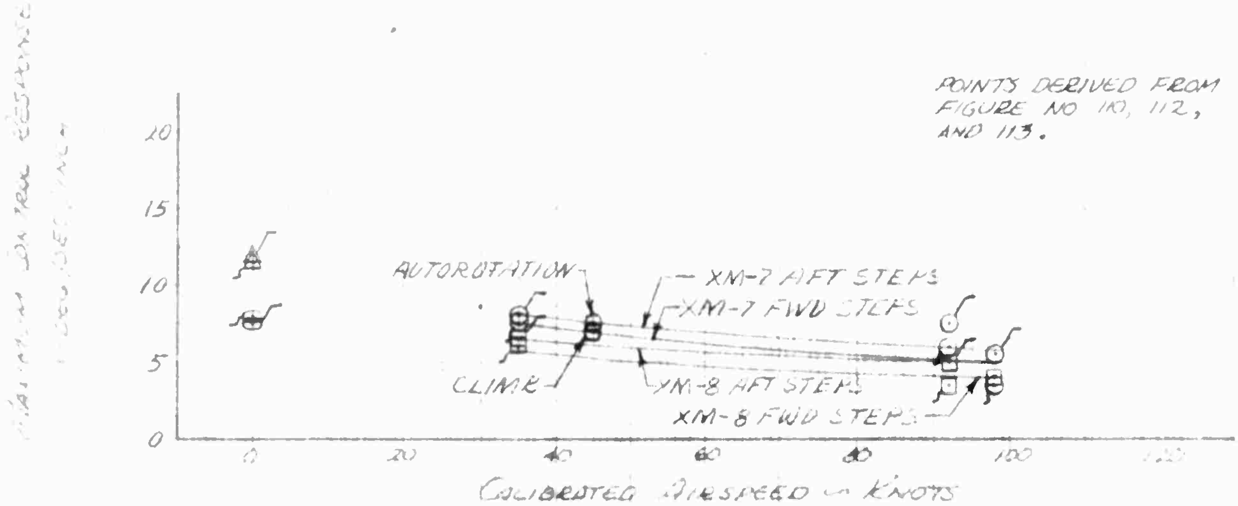
FIGURE NO. 104

SUMMARY OF LONGITUDINAL CONTROL RESPONSE

OH 4A USA S/N 62-4204

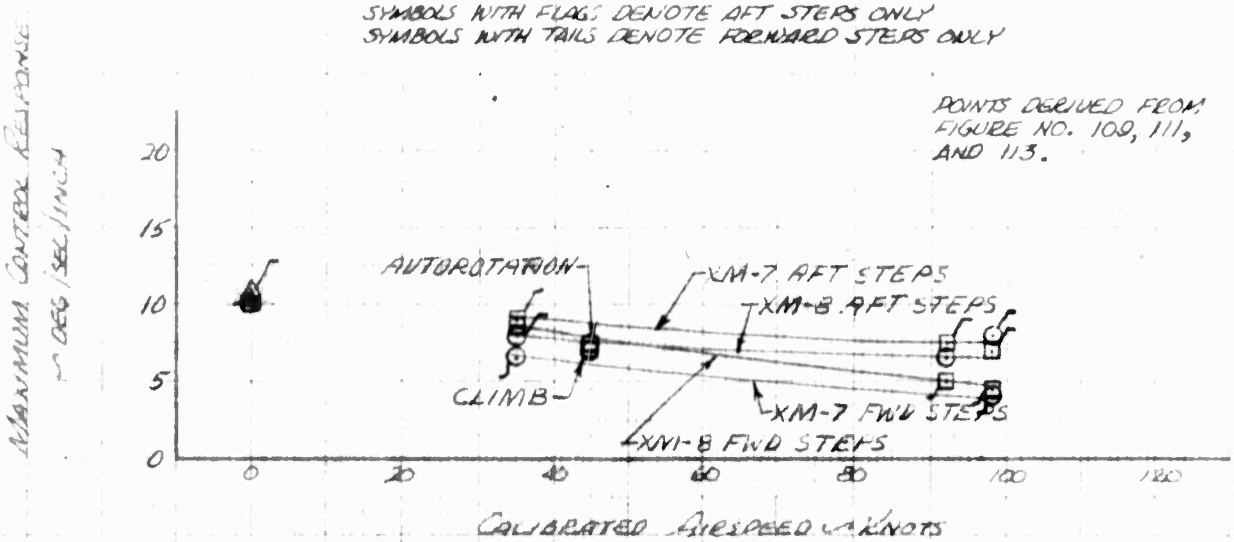
SYM	AVG H_D ~FT	AVG G.W. ~LB	AVG CG ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
△	590	2675	105.05	1.25LT	394	XM-7	SAE ON HOVER (IGE)
⬭	390	2650	105.40	1.30LT	394	XM-8	SAE ON HOVER (IGE)
◯	4985	2555	104.50	1.25LT	394	XM-7	SAE ON LEVEL FLIGHT AND NOTED
□	4960	2560	105.05 (AFT)	1.30LT	394	XM-8	SAE ON LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH FORWARD AND AFT STEPS
SYMBOLS WITH FLAGS DENOTE AFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE FORWARD STEPS ONLY



SYM	AVG H_D ~FT	AVG G.W. ~LB	AVG CG ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
⬭	535	2650	104.95	1.25LT	394	XM-7	SAE OFF HOVER (IGE)
△	300	2640	105.40	1.30LT	394	XM-8	SAE OFF HOVER (IGE)
□	4910	2570	104.55	1.25LT	394	XM-7	SAE OFF LEVEL FLIGHT AND NOTED
◯	4850	2600	105.20 (AFT)	1.30LT	394	XM-8	SAE OFF LEVEL FLIGHT AND NOTED

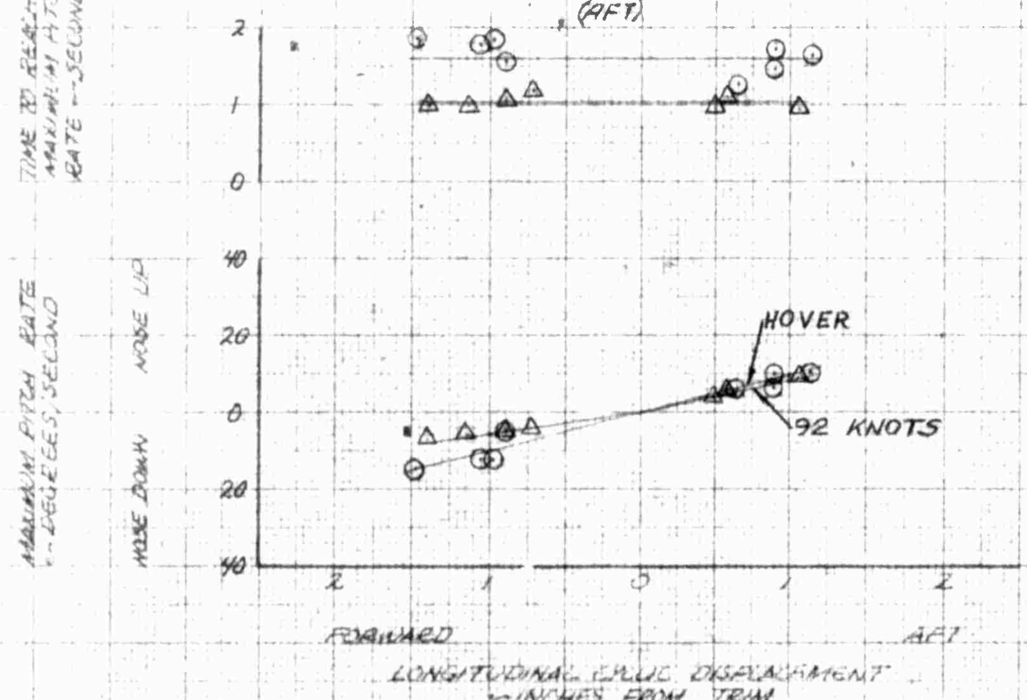
OPEN SYMBOLS DENOTE BOTH FORWARD AND AFT STEPS
SYMBOLS WITH FLAGS DENOTE AFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE FORWARD STEPS ONLY

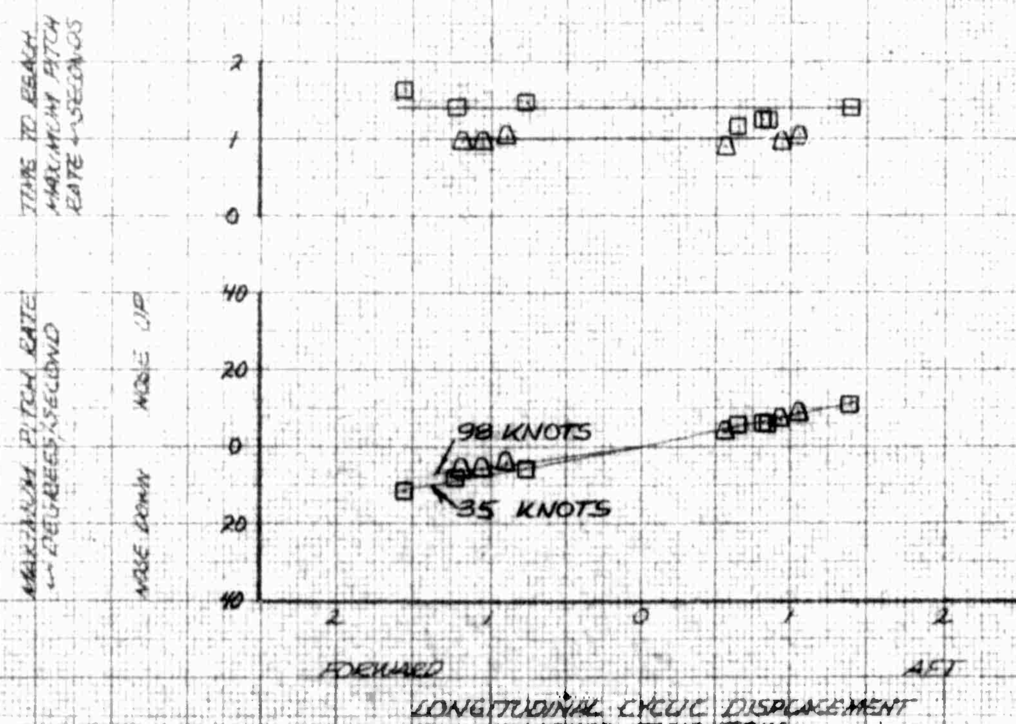


FOR OFFICAL USE ONLY

LONGITUDINAL CONTROL RESPONSE
OH-4A BOA S/N 62-4204
SAE OFF

SYM	AIRSPEED ~KIAS	AVG Hp ~FT	AVG GW ~LB	AVG CG ~IN LONG	AVG CG ~IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	780	2635	105.75	.35 RT	394	CLEAN	HOVER (IGE)
□	35 KTS	4940	2570	105.60	.35 RT	394	CLEAN	LEVEL FLIGHT
△	92 KTS	4190	2545	105.45	.35 RT	394	CLEAN	LEVEL FLIGHT
△	98 KTS	4650	2530	104.40 (AFT)	.35 RT	394	CLEAN	LEVEL FLIGHT





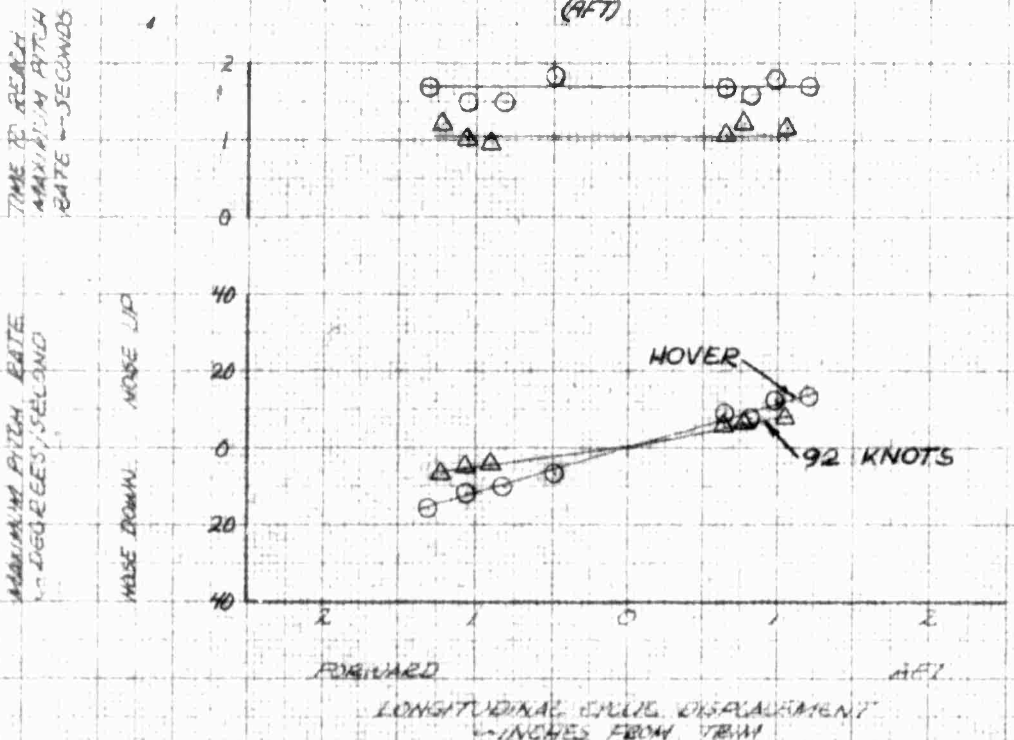
FOR OFFICIAL USE ONLY

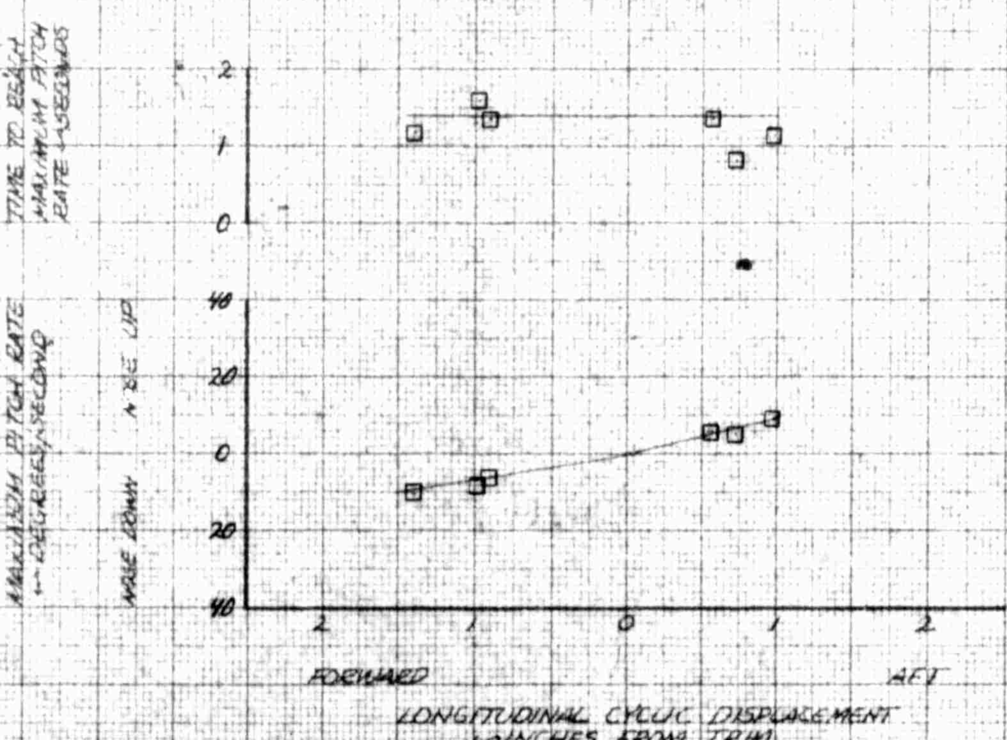
LONGITUDINAL CONTROL RESPONSE

OH-4A USA S/N 62-4204

SAE OFF

SYM	AIRSPEED ~ CAS	AVG H_p ~ FT	AVG GW ~ LB	AVG C.G. ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	950	2920	105.05	.35 RT.	394	CLEAN	HOVER (IGE)
□	35 KTS	5220	2856	104.85	.35 RT.	394	CLEAN	LEVEL FLIGHT
△	92 KTS	5410	2825	104.70 (AFT)	.35 RT.	394	CLEAN	LEVEL FLIGHT



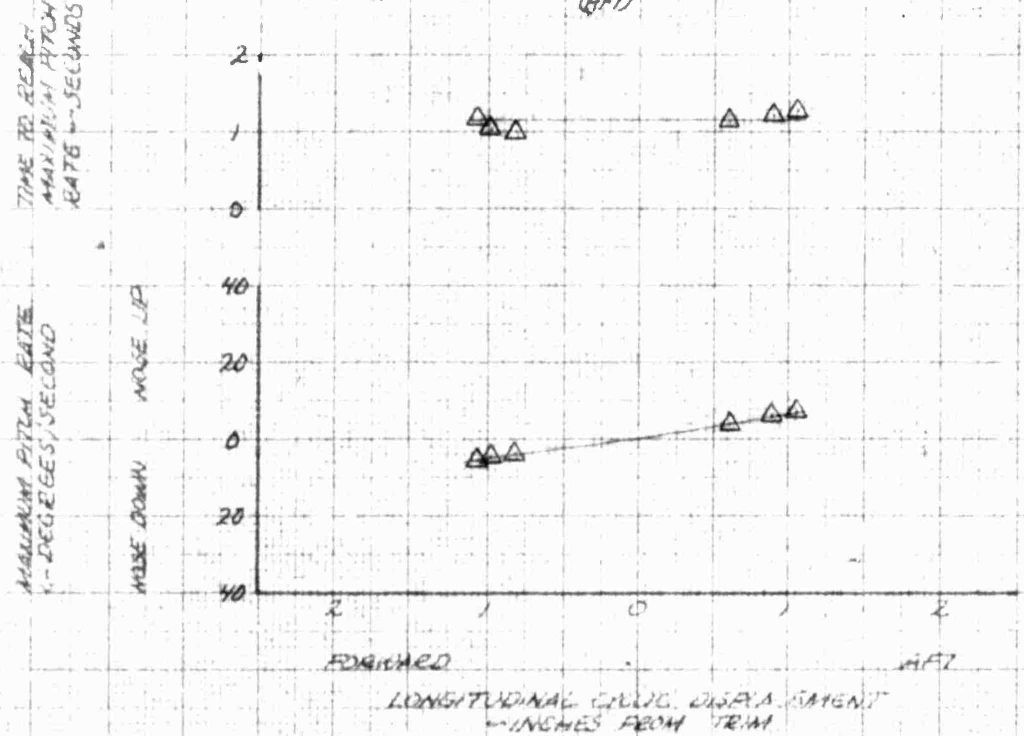


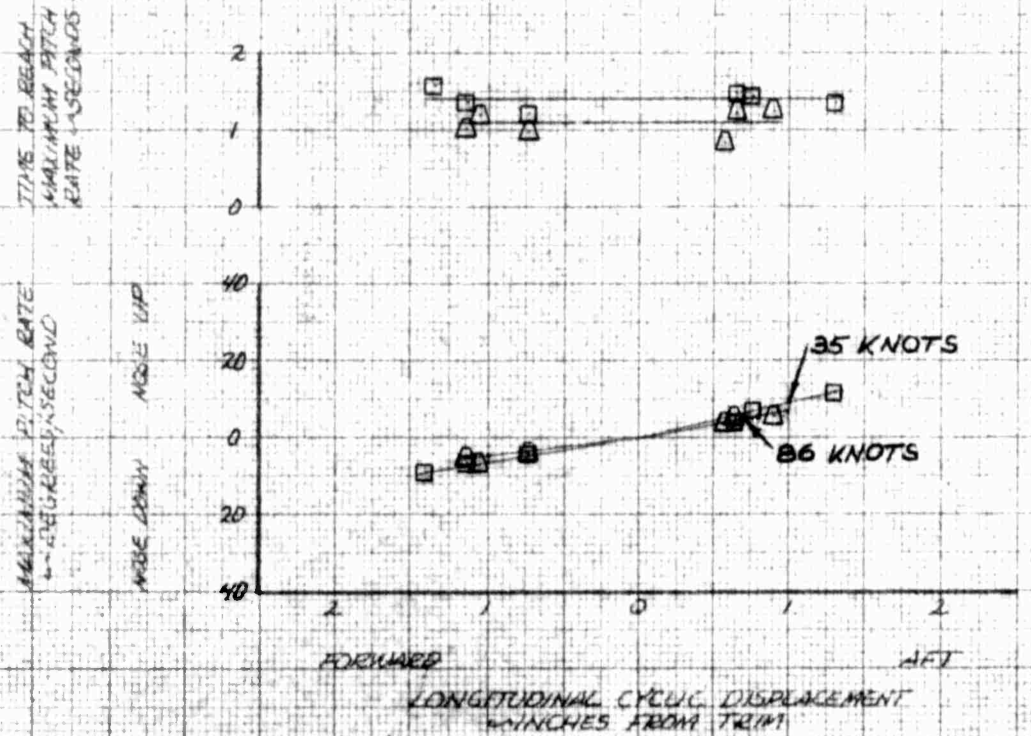
FOR OFFICAL USE ONLY

OH-4A USA S/N 62-4204

SAE OFF

SYM	AIRSPEED ~KCAS	AVG Hp ~FT	AVG GW ~LB	AVG CG ~IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
□	35 KTS	9465	2565	105.55	.35 RT	394	CLEAN	LEVEL FLIGHT
△	76 KTS	10090	2550	105.45	.35 RT	394	CLEAN	LEVEL FLIGHT
△	86 KTS	10200	2530	104.40 (AFT)	.35 RT	394	CLEAN	LEVEL FLIGHT



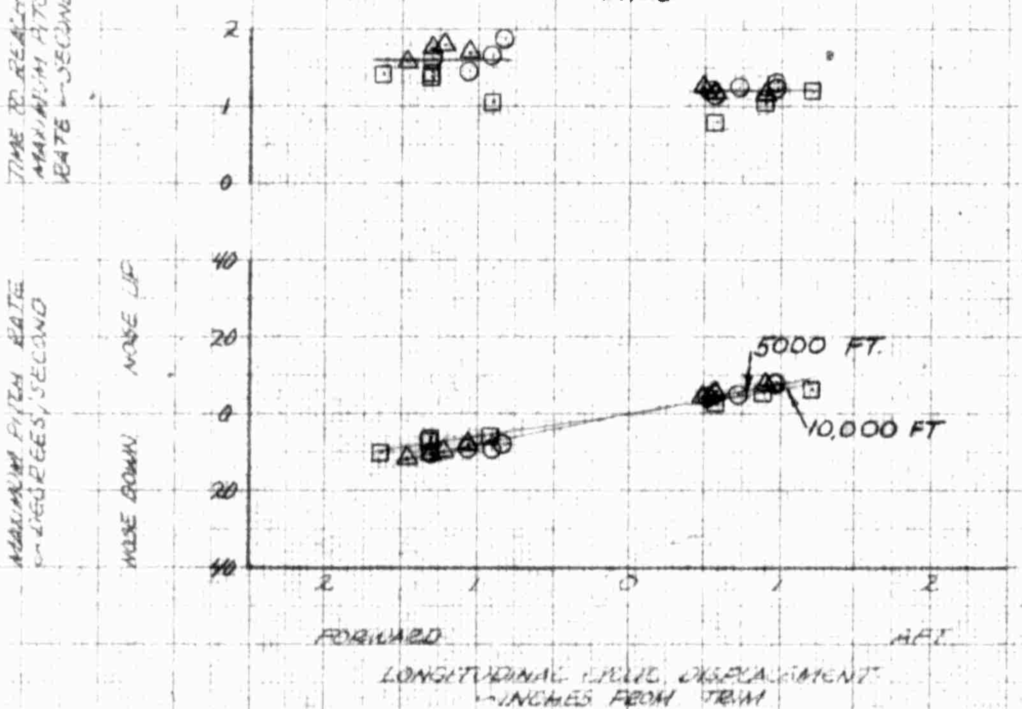


OH-4A USA S/N 62-4204

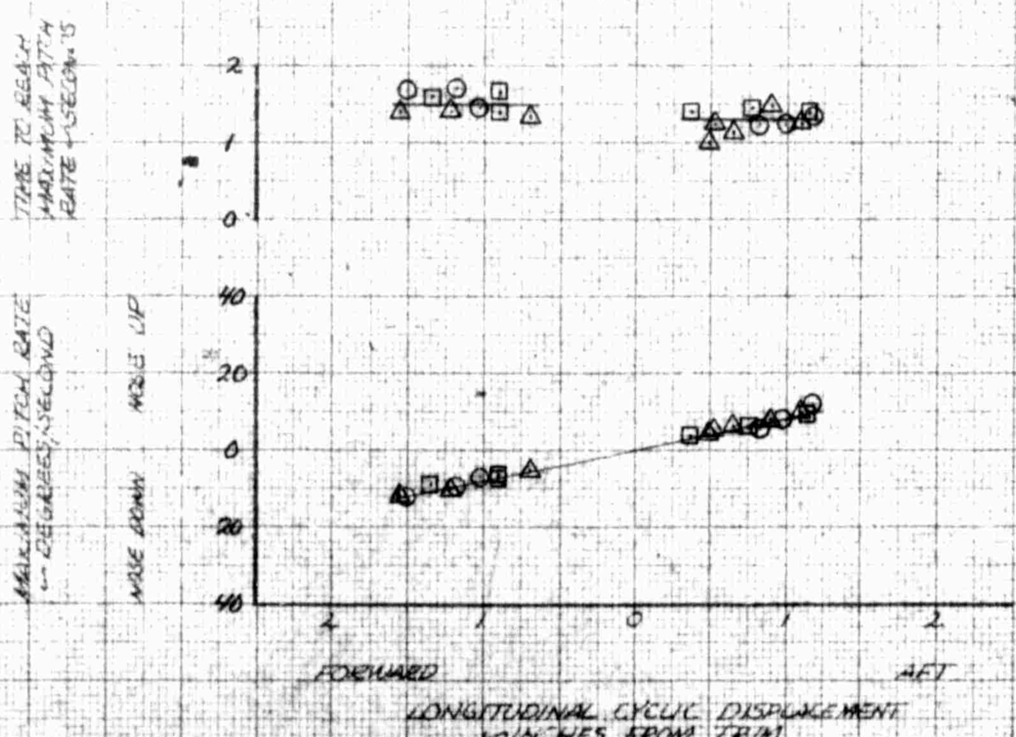
SAE OFF

SYM	AIRSPEED ~KCAS	AVG Hp ~FT	AVG GW ~LB	AVG CG ~IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	45 KTS	5000	2600	105.70	.35 RT	394	CLEAN	NOTED
□	45 KTS	10000	2590	105.70	.35 RT	394	CLEAN	NOTED
△	45 KTS	5000	2910	105.10 (AFT)	.75 LT	394	CLEAN	NOTED

CLIMB



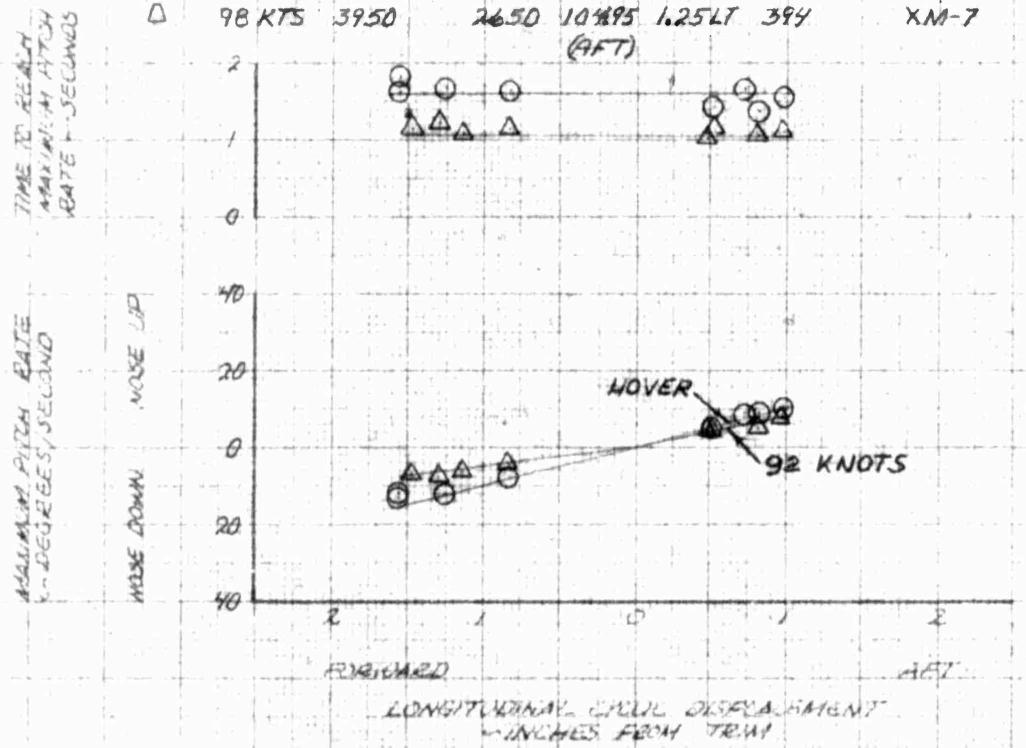
AUTOROTATION



OH-4A USA S/N 62-4202

SAE OFF

SYM	AIRSPEED ~KCAS	AVG Hp ~FT	AVG GW ~LB	AVG CG ~IN LONG.	LAT.	ROTOR RPM	CONFIGURATION	FLT COND.
○	ZERO	535	2650	104.95	1.25 LT	394	XM-7	HOVER (IGE)
□	35 KTS	4600	2540	104.50	1.25 LT	394	XM-7	LEVEL FLIGHT
△	92 KTS	4995	2495	104.40	1.25 LT	394	XM-7	LEVEL FLIGHT
△	98 KTS	3950	2650	104.95 (AFT)	1.25 LT	394	XM-7	LEVEL FLIGHT



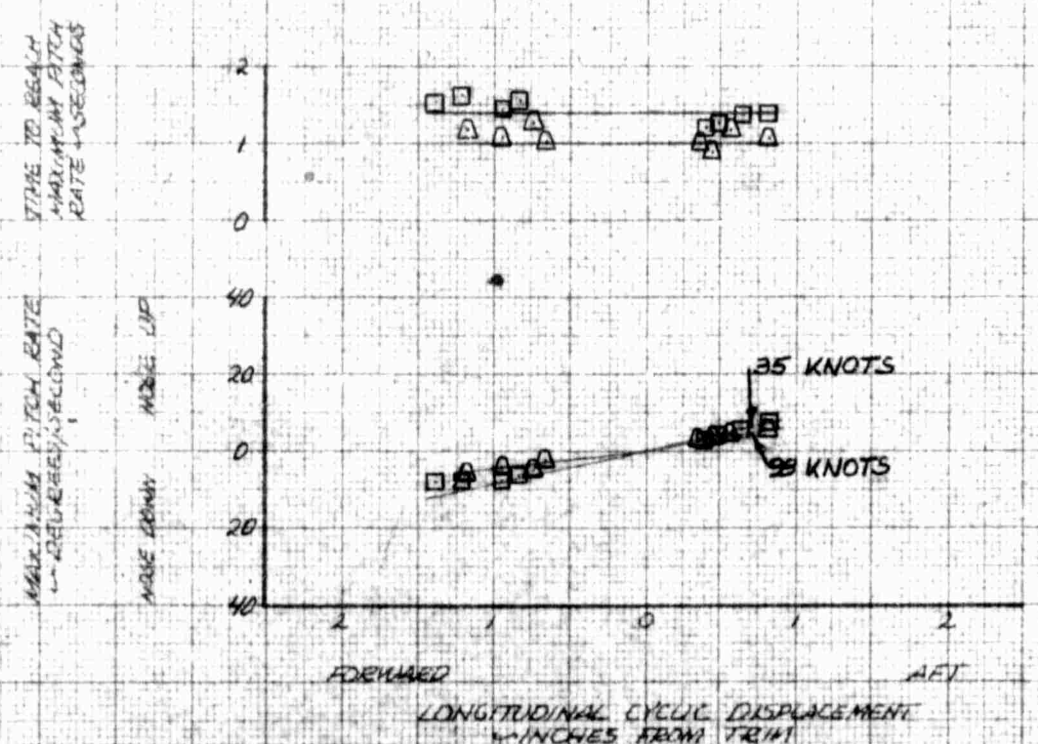
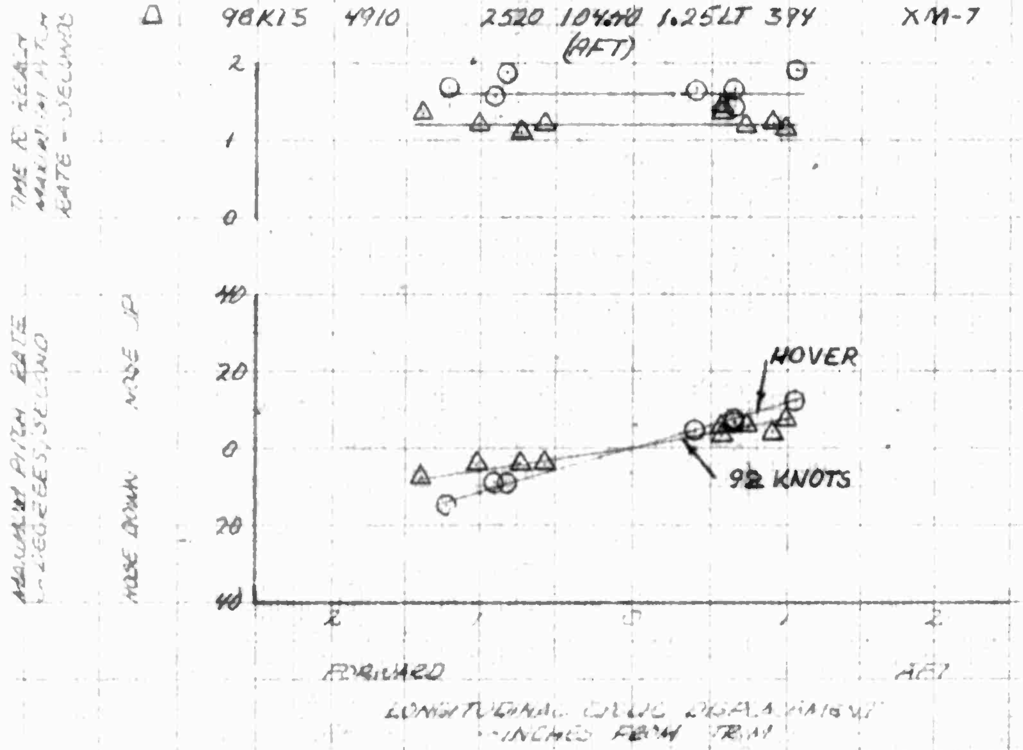
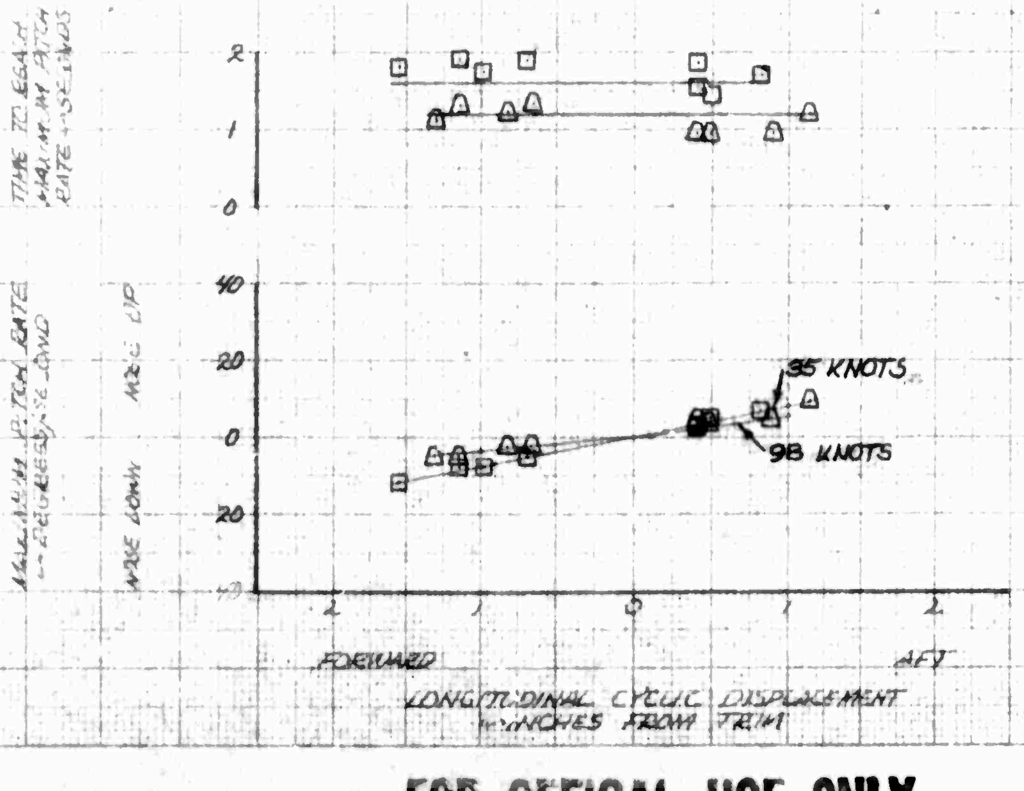


FIGURE NO 110
LONGITUDINAL CONTROL RESPONSE
OH-4A USA S/N 62-4204
SAE ON

SYM	AIRSPEED ~KCAS	AVG Hp ~FT	AVG GW ~LB	AVG CG ~IN LONG (AFT)	AVG CG ~IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	590	2675	105.05	1.25 LT	394	XM-7	HOVER (IGE)
□	35 KTS	4785	2575	104.60	1.25 LT	394	XM-7	LEVEL FLIGHT
△	92 KTS	5230	2545	104.50	1.25 LT	394	XM-7	LEVEL FLIGHT
△	98 KTS	4910	2520	104.40	1.25 LT	394	XM-7	LEVEL FLIGHT

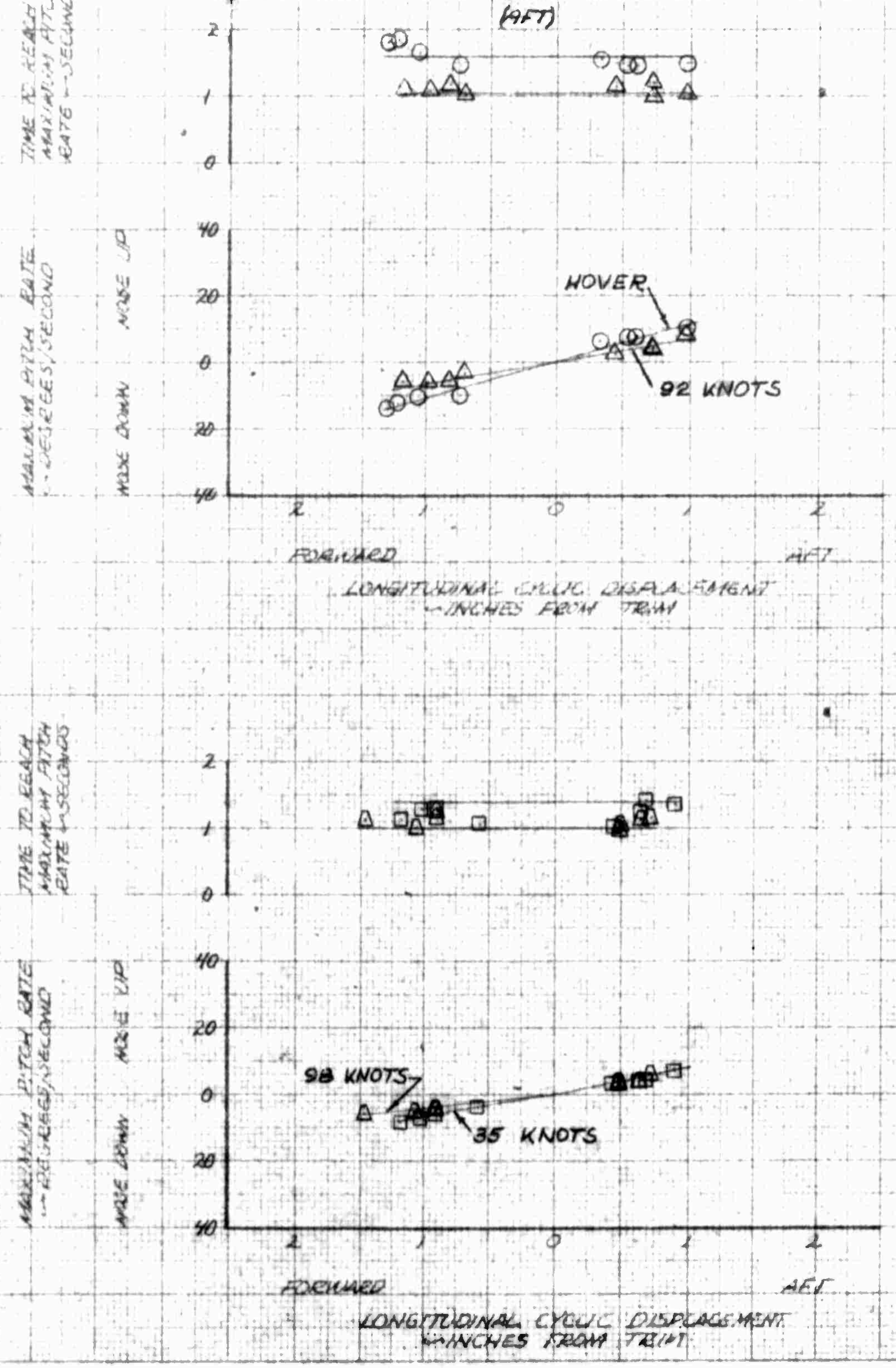




FOR OFFICIAL USE ONLY

FIGURE NO 111B
LONGITUDINAL CONTROL RESPONSE
OH-4A USA S/N 62-4204
SAE OFF

SYM	AIRSPEED ~CAS	AVG Hp ~FT	AVG GW ~LB	AVG CG~IN LONG	AVG CG~IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	300	2640	105.40	1.30 LT	394	XM-8	HOVER (I.G.E.)
□	35 KTS	4730	2605	104.95	1.30 LT	394	XM-8	LEVEL FLIGHT
△	92 KTS	4630	2580	104.85	1.30 LT	394	XM-8	LEVEL FLIGHT
△	98 KTS	4900	2495	104.95 (AFT)	1.30 LT	394	XM-8	LEVEL FLIGHT



FOR OFFICAL USE ONLY

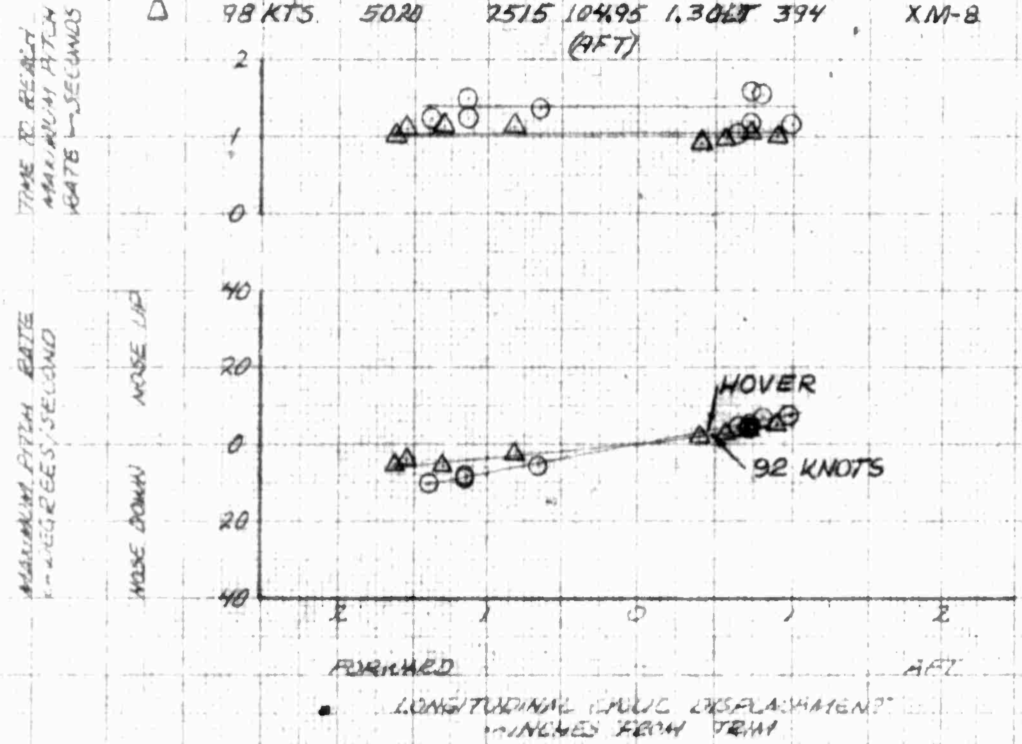
FIGURE NO. 112

LONGITUDINAL CONTROL RESPONSE

OH-4A USA S/N 62-4204

SAE ON

SYM	AIRSPEED ~KCAS	AVG Hp ~FT	AVG GW ~LB	AVG CG ~IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	390	2650	105.40	1.30LT	394	XM-8	HOVER (IGE)
□	35 KTS	4885	2555	105.05	1.30LT	394	XM-8	LEVEL FLIGHT
△	92 KTS	4908	2535	105.00	1.30LT	394	XM-8	LEVEL FLIGHT
◺	98 KTS	5020	2515	104.95 (AFT)	1.30LT	394	XM-8	LEVEL FLIGHT



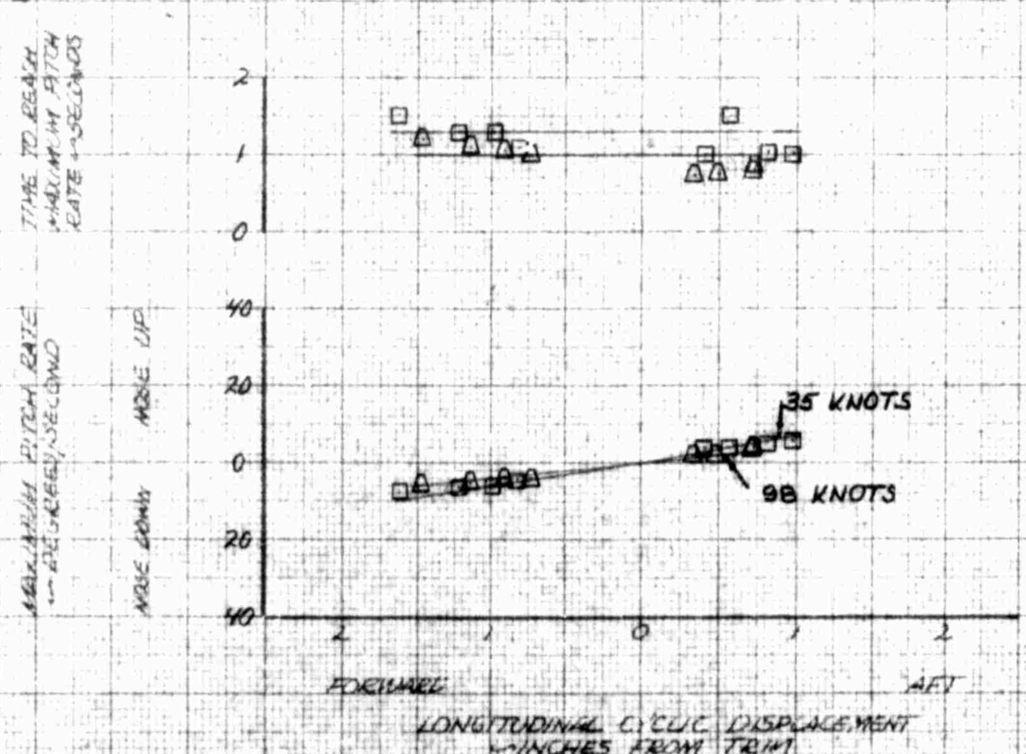
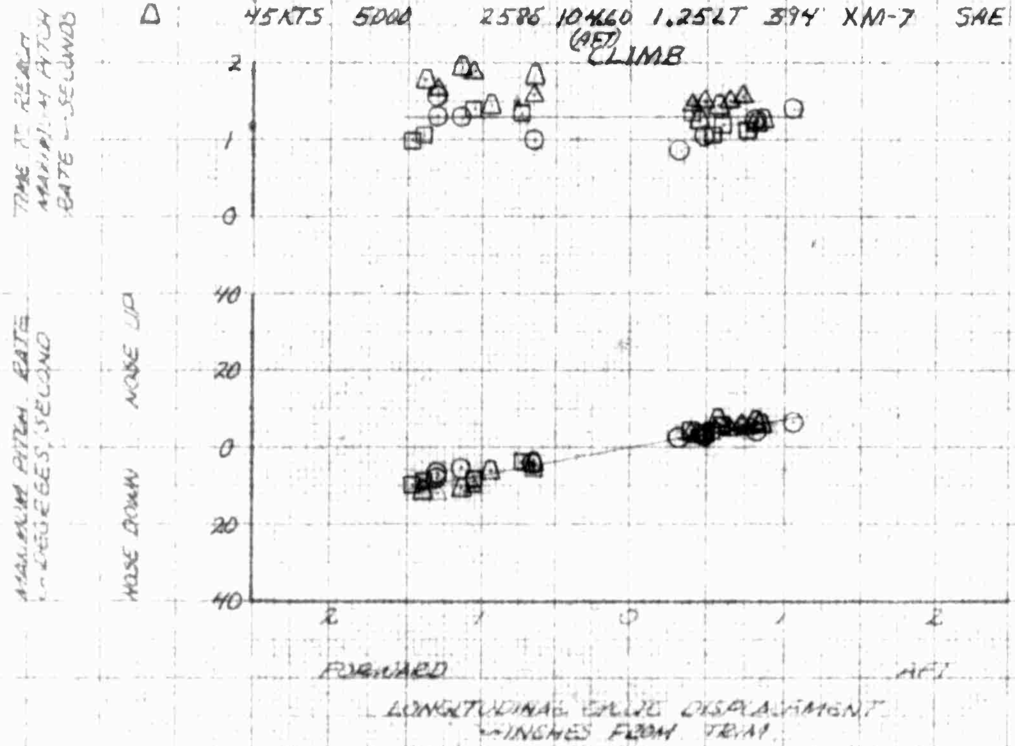


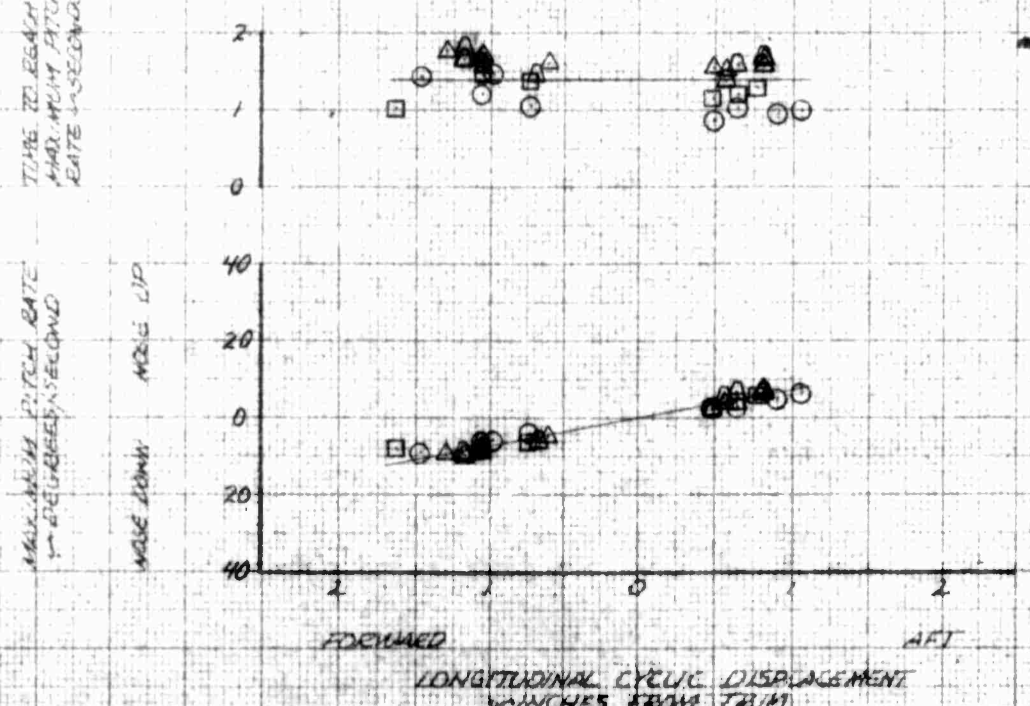
FIGURE NO 113
LONGITUDINAL CONTROL RESPONSE
OH-4A LOA S/N 62-4204

SYM	AIRSPEED ~KCAS	AVG Hp ~FT	AVG GW ~LB	AVG CG ~IN LONG	LAT	ROTOR RPM	CONFIGURATION		FLT COND
○	45KTS	5000	2600	105.20	1.30LT	394	XM-8	SAE ON	NOTED
□	45KTS	5000	2665	105.20	1.30LT	394	XM-8	SAE OFF	NOTED
△	45KTS	5000	2620	104.80	1.25LT	394	XM-7	SAE ON	NOTED
△	45KTS	5000	2586	104.60 (AFT)	1.25LT	394	XM-7	SAE OFF	NOTED

CLIMB



AUTOROTATION



FOR OFFICIAL USE ONLY

FIGURE NO. 114

SUMMARY OF ANGULAR PITCH DISPLACEMENT

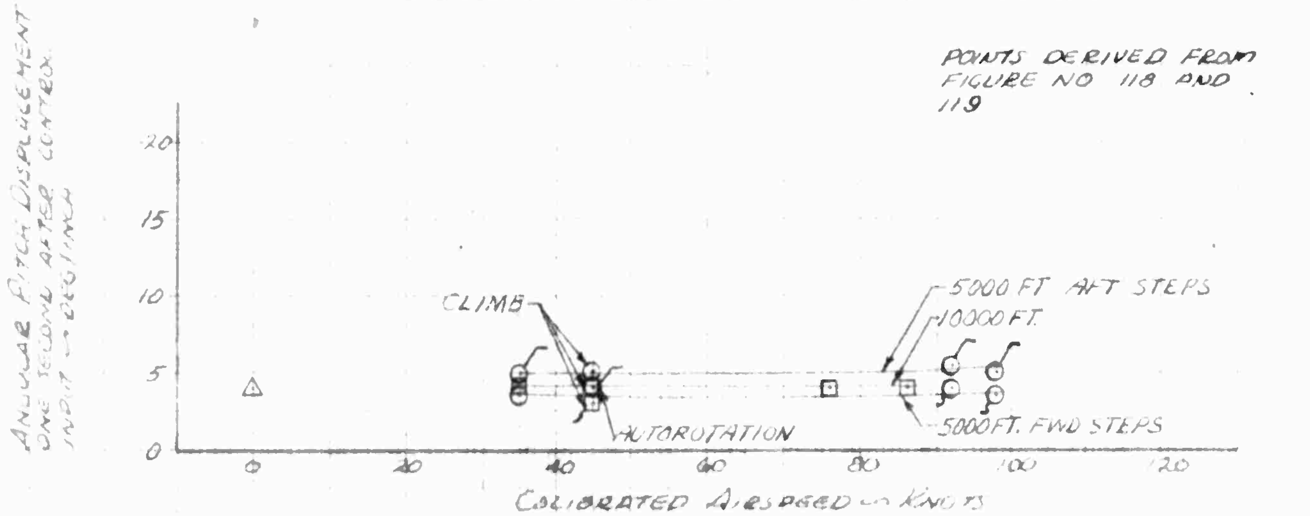
OH-4A USA S/N 62-4204

SAE OFF

SYM	AVG H_p ~FT	AVG G.W. ~LB	AVG C.G. ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND.
△	780	2635	105.75	.35 RT	394	CLEAN	HOVER (IGE)
○	4755	2570	105.40	.35 RT	394	CLEAN	LEVEL FLIGHT AND NOTED
□	9950	2565	105.40 (AFT)	.35 RT	394	CLEAN	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH FORWARD AND AFT STEPS
SYMBOLS WITH FLAGS DENOTE AFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE FORWARD STEPS ONLY

POINTS DERIVED FROM FIGURE NO 118 AND 119



SYM	AVG H_p ~FT	AVG G.W. ~LB	AVG C.G. ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND.
□	950	2920	105.05	.75 LT	394	CLEAN	HOVER (IGE)
△	5160	2875	104.85 (AFT)	.75 LT	394	CLEAN	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS BOTH FORWARD AND AFT STEPS
SYMBOLS WITH FLAGS DENOTE AFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE FORWARD STEPS ONLY

POINTS DERIVED FROM FIGURE NO. 117 AND 119

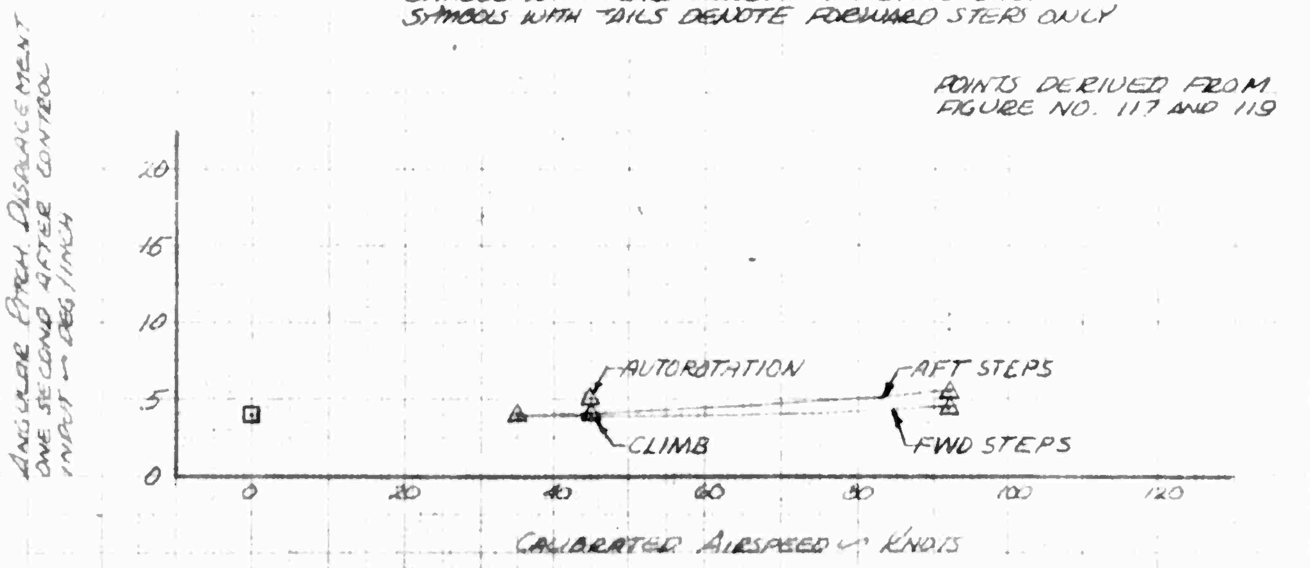
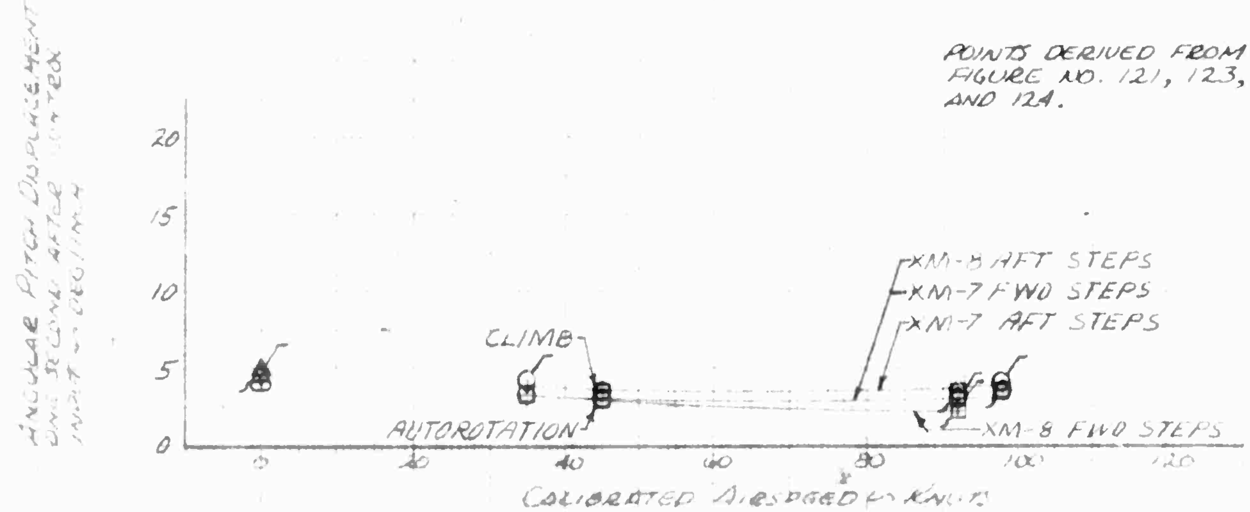


FIGURE NO. 115
SUMMARY OF ANGULAR PITCH DISPLACEMENT
OH-4A USA S/N 62-4204

SYM	AVG H_p ~FT	AVG G.W. ~LB	AVG C.G. ~ IN LONG	AVG C.G. ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
△	590.	2675	105.05	1.25LT	394	XM-7	SAE ON HOVER (IGE)
⬭	390	2650	105.40	1.30LT	394	XM-8	SAE ON HOVER (IGE)
○	4985	2555	104.50	1.25LT	394	XM-7	SAE ON LEVEL FLIGHT AND NOTED
□	4960	2560	105.05 (AFT)	1.30LT	394	XM-8	SAE ON LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH FORWARD AND AFT STEPS
SYMBOLS WITH FLAGS DENOTE AFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE FORWARD STERS ONLY



SYM	AVG H_p ~FT	AVG G.W. ~LB	AVG C.G. ~ IN LONG	AVG C.G. ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
⬭	535	2650	104.95	1.25LT	394	XM-7	SAE OFF HOVER (IGE)
□	300	2640	105.40	1.30LT	394	XM-8	SAE OFF HOVER (IGE)
△	4910	2570	104.55	1.25LT	394	XM-7	SAE OFF LEVEL FLIGHT AND NOTED
○	4850	2600	105.20 (AFT)	1.30LT	394	XM-8	SAE OFF LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH FORWARD AND AFT STEPS
SYMBOLS WITH FLAGS DENOTE AFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE FORWARD STEPS ONLY

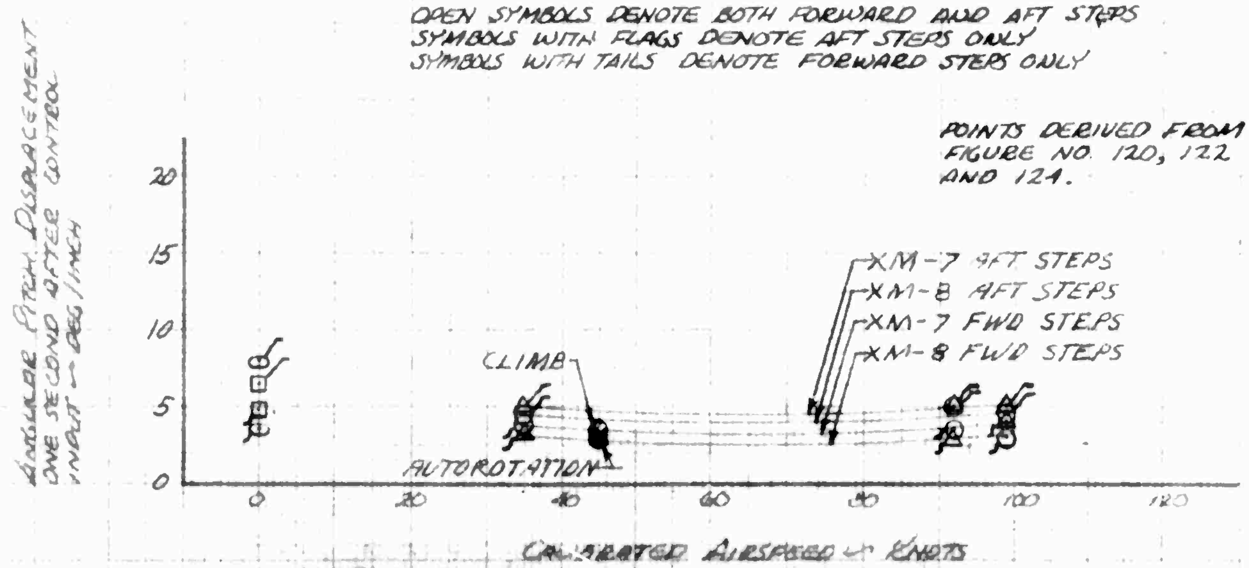
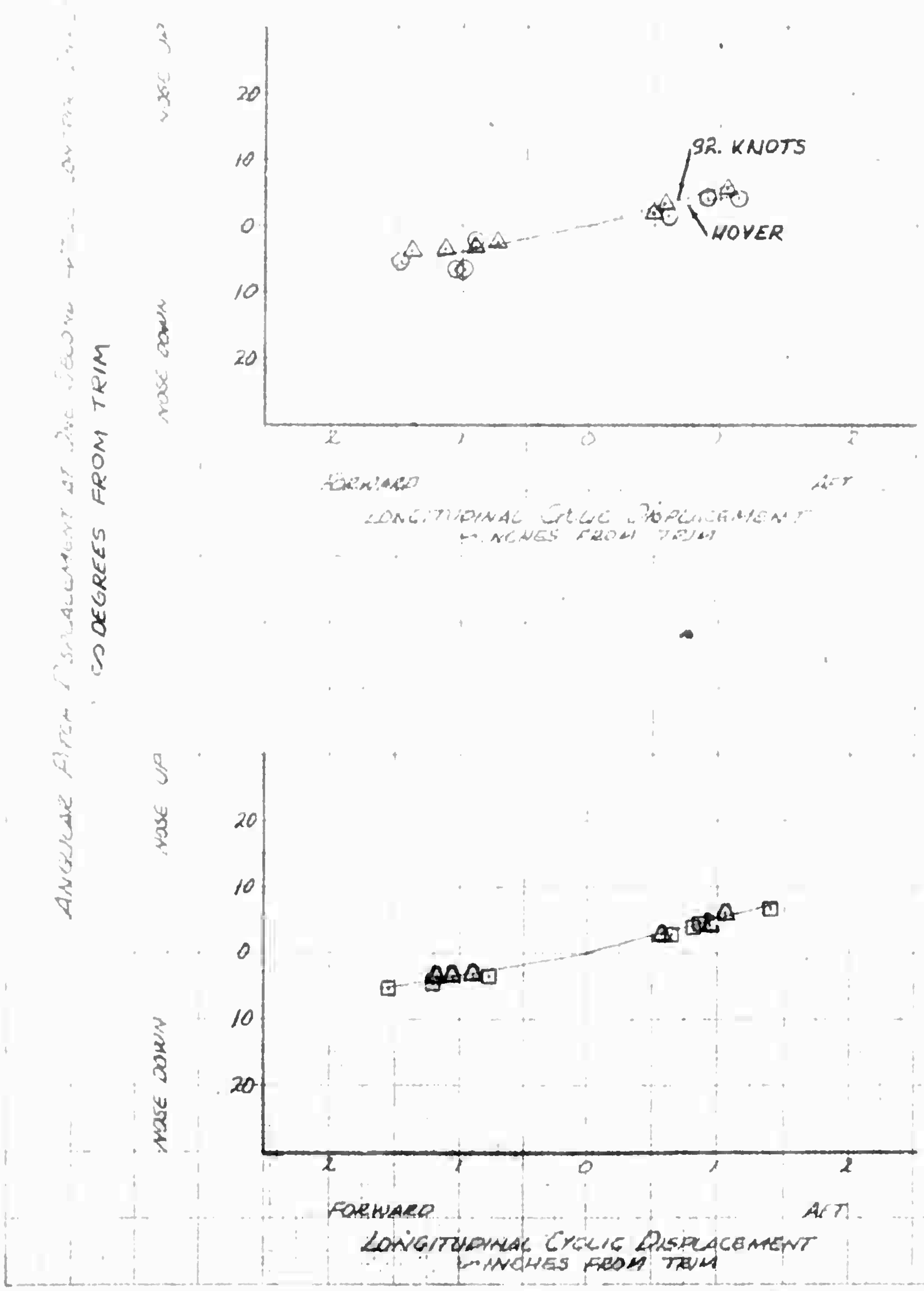


FIGURE AD 116
ANGULAR PITCH DISPLACEMENT
OH 6A USA S/N [illegible]
SAE OFF

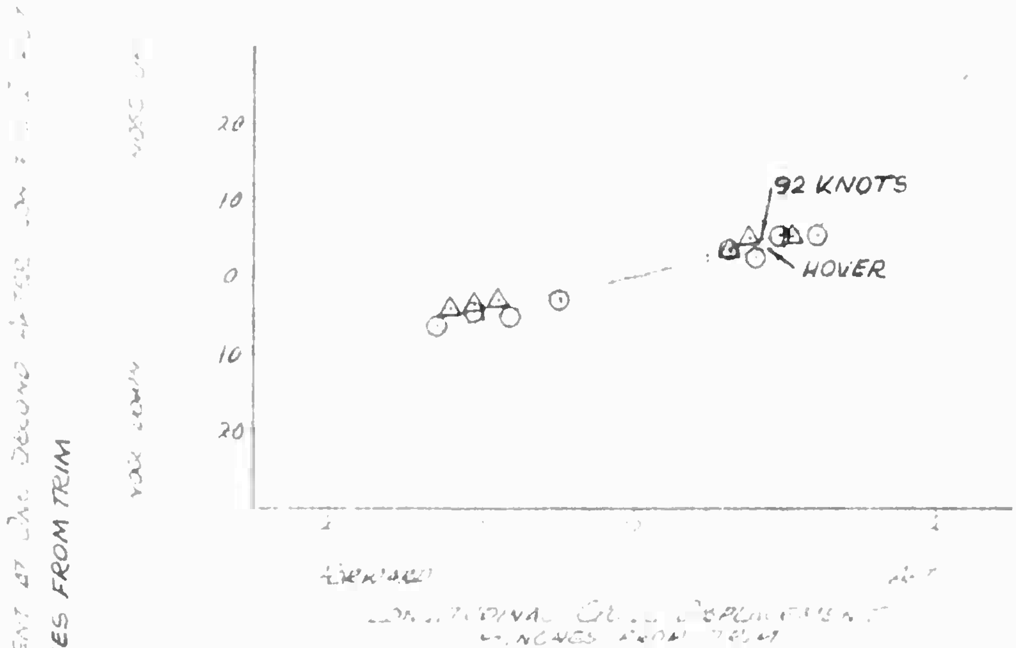
SYM	AIRSPEED KCAS	AVG Hp FT	AVG GW LB	AVG CG IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	780	2635	105.15	.36RT	394	CLEAN	HOVER (IGE)
□	35KTS	4940	2570	105.60	.35RT	394	CLEAN	LEVEL FLIGHT
△	92KTS	4190	2545	105.45	.35RT	394	CLEAN	LEVEL FLIGHT
◺	98KTS	4650	2530	104.40 (AFT)	.35RT	394	CLEAN	LEVEL FLIGHT

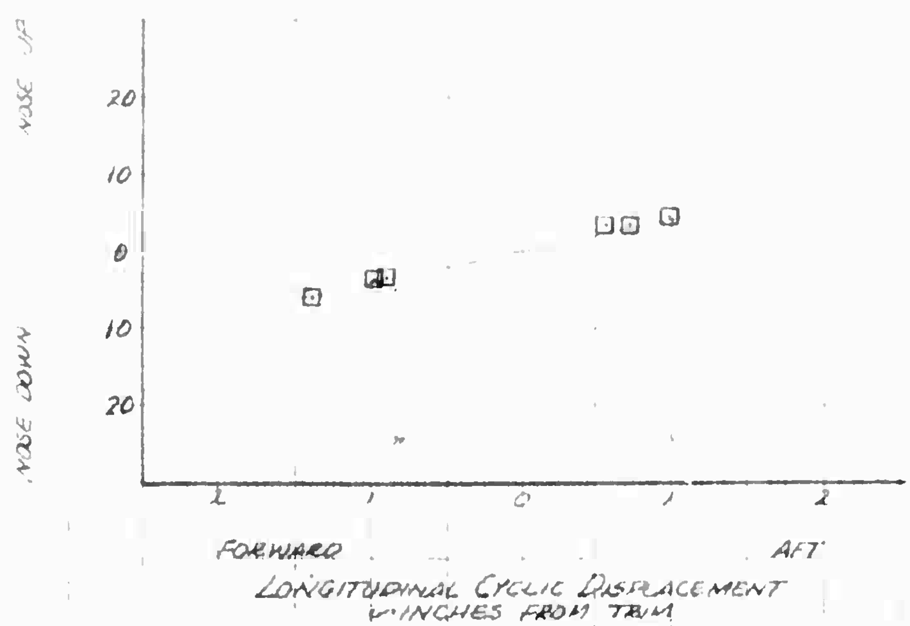


FOR OFFICAL USE ONLY

FIGURE NO 117
ANGULAR PITCH DISPLACEMENT
[illegible]
SAE OFF

SYM	CALIBRATED AIRSPEED KCAS	AVG HD FEET	AVG GW LB	AVG LONG CG	LAT CG	ROTOR RPM	CONFIGURATION	FLIGHT CONDITION
○	ZERO	950	2420	105.05	.35RT	394	CLEAN	HOVER (IGE)
□	35KTS	5220	2855	104.85	.35RT	394	CLEAN	LEVEL FLIGHT
△	92KTS	5410	2825	104.72 (AFT)	.35RT	394	CLEAN	LEVEL FLIGHT





FOR OFFICAL USE ONLY

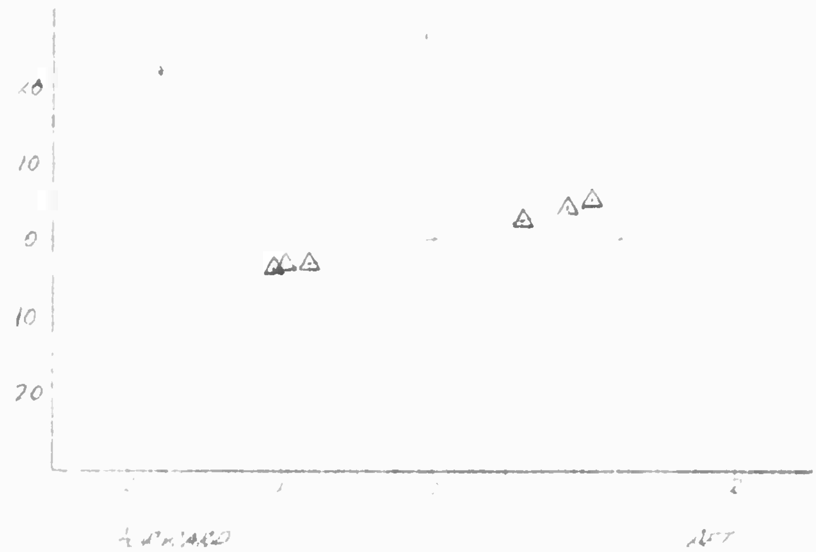
FIGURE NO 118

DISPLACEMENT

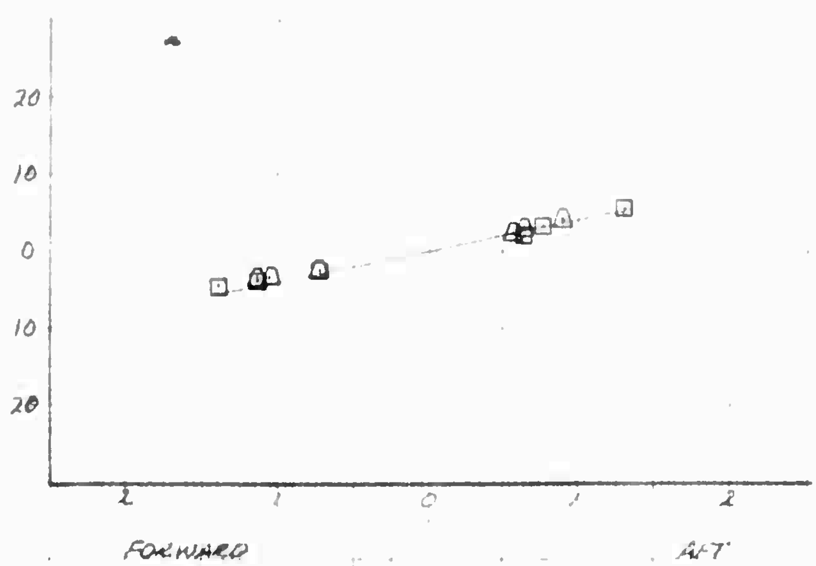
SAE OFF

				AVG CG LONG	LAT	ROTOR RPM	CONFIGURATION	
□	35KTS	4465	2563	105.55	.35RT	394	CLEAN	LEVEL FLIGHT
△	76KTS	10040	2550	105.4[illegible]	.35RT	394	CLEAN	LEVEL FLIGHT
[illegible]	66KTS	10200	2530	104.40 (AFT)	.35RT	394	CLEAN	LEVEL FLIGHT

DEGREES FROM TRIM



LONGITUDINAL CYCLIC DISPLACEMENT ~ INCHES FROM TRIM



LONGITUDINAL CYCLIC DISPLACEMENT ~ INCHES FROM TRIM

FOR OFFICAL USE ONLY

FIGURE NO 119

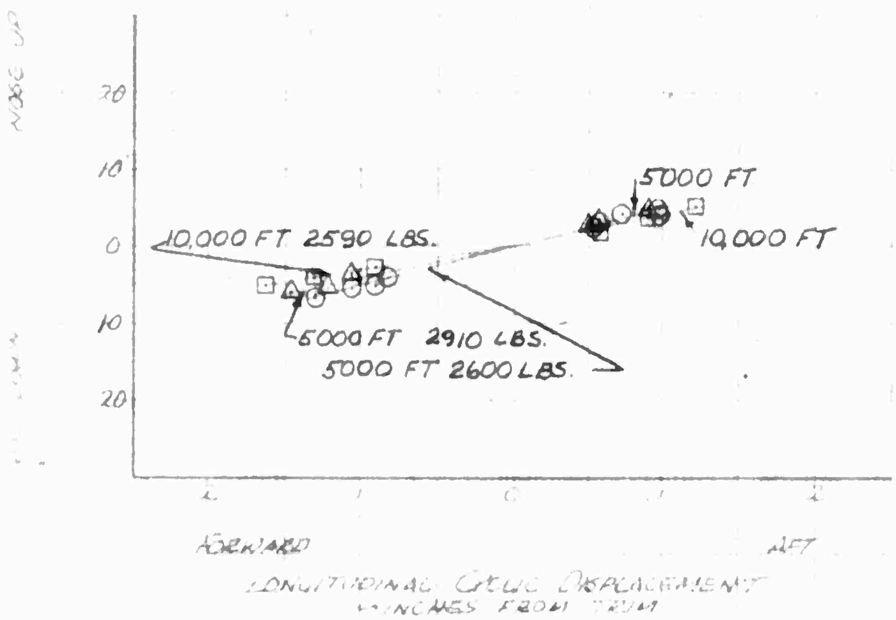
ANGULAR PITCH DISPLACEMENT

OH-4A USA S/N 62-4202

SAE OFF

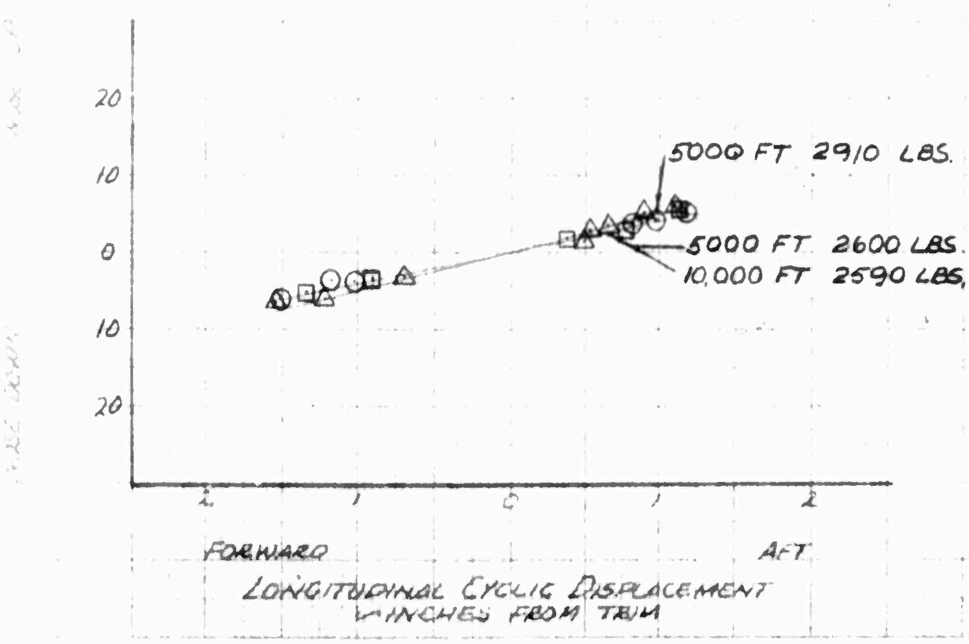
SYM	AIRSPEED KCAS	AVG Hp FT	AVG GW LB	AVG LONG	C.G. IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	45KTS	5000	2600	105.70	.35RT	394	CLEAN	NOTED
□	45KTS	10000	2590	105.70	.35RT	394	CLEAN	NOTED
△	45 KTS	5000	2910	105.10 (AFT)	.75LT	394	CLEAN	NOTED

CLIMB



DEGREES FROM TRIM

AUTOROTATION



FOR OFFICAL USE ONLY

FIGURE No 120
ANGULAR PITCH DISPLACEMENT
OH-4A USA S/N 62-4204
SAE OFF

SYM	AIRSPEED ~CAS	AVG Hp ~FT	AVG G.W ~LB	AVG CG ~IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	535	2650	104.95	1.25LT	394	XM-7	HOVER (IGE)
□	35 KTS	4600	2540	104.50	1.25LT	394	XM-7	LEVEL FLIGHT
△	92 KTS	4995	2500	104.40	1.25LT	394	XM-7	LEVEL FLIGHT
⌂	98 KTS	3950	2650	104.95 (AFT)	1.25LT	394	XM-7	LEVEL FLIGHT

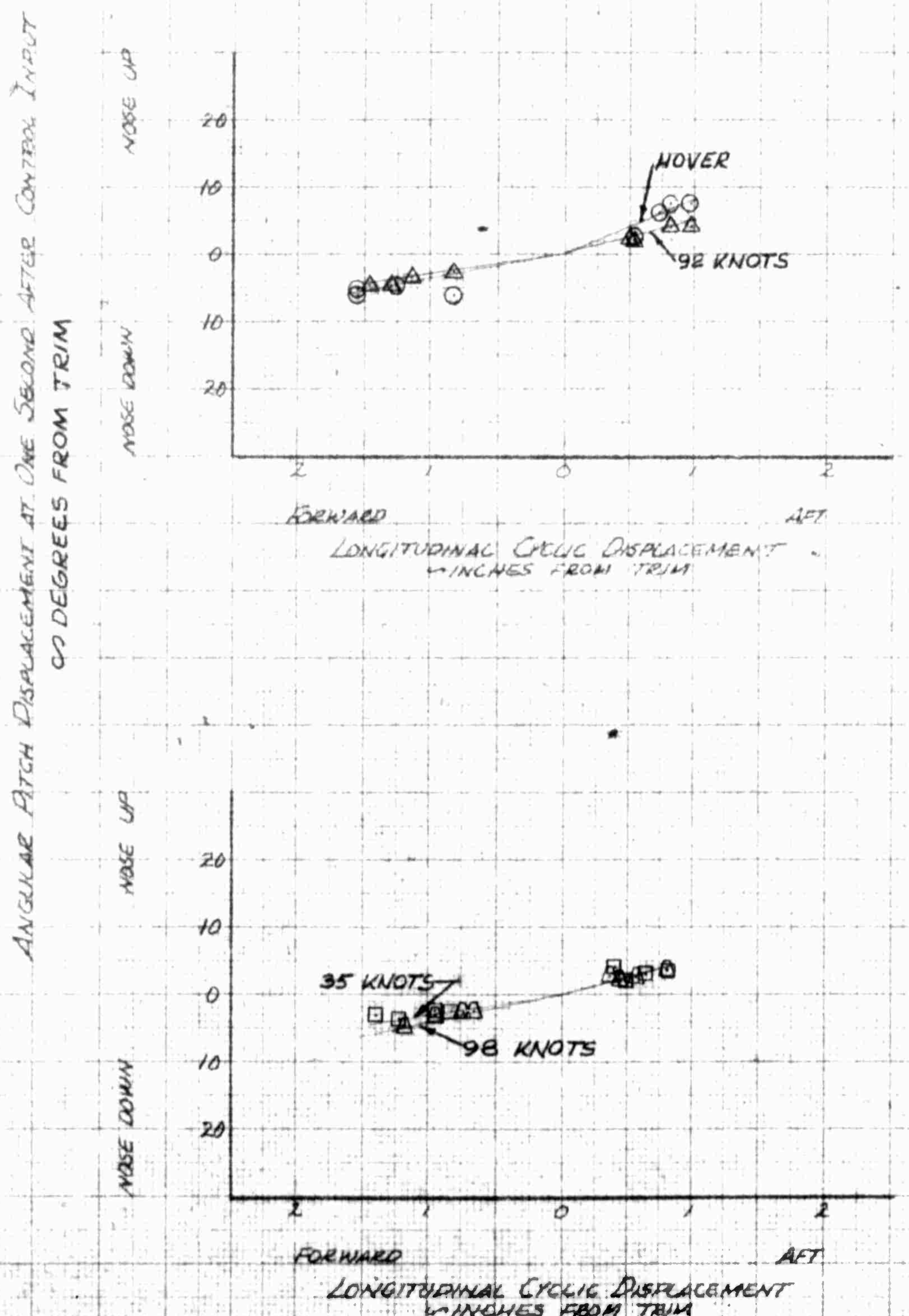
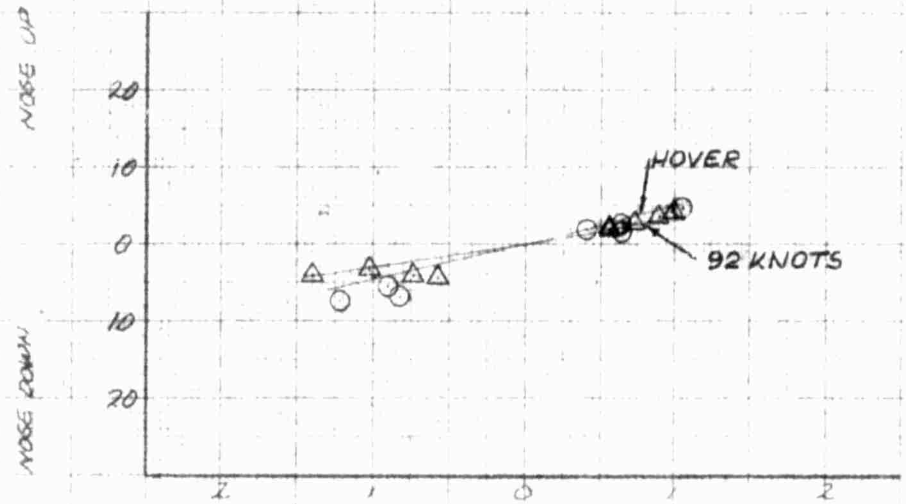


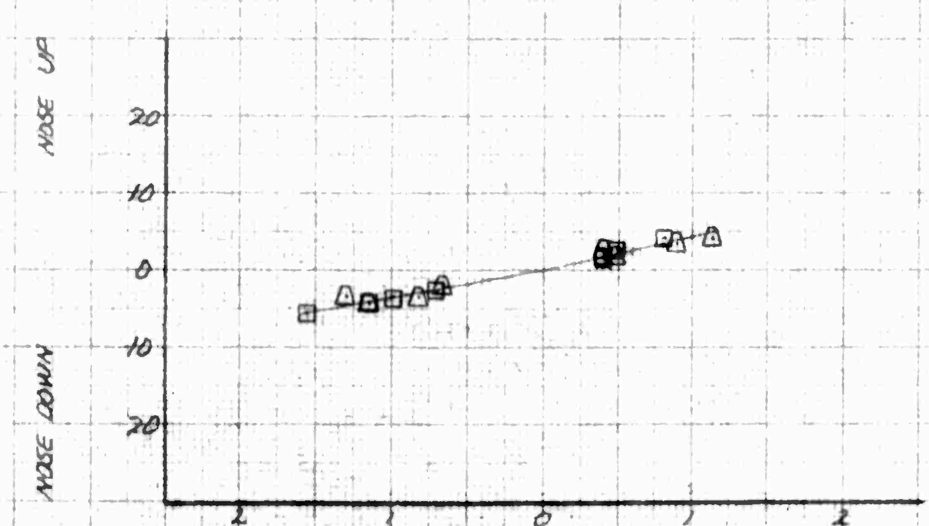
FIGURE NO 121
ANGULAR PITCH DISPLACEMENT
OH-4A USA S/N 62-4204
SAE ON

SYM	AIRSPEED ~ KCAS	AVG Hp ~ FT	AVG G.W. ~ LB	AVG CG ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	590	2675	105.05	1.25 LT	394	XM-7	HOVER (IGE)
□	35 KTS	4785	2575	104.60	1.25 LT	394	XM-7	LEVEL FLIGHT
△	92 KTS	5230	2545	104.50	1.25 LT	394	XM-7	LEVEL FLIGHT
⌂	98 KTS	4910	2520	104.40 (AFT)	1.25 LT	394	XM-7	LEVEL FLIGHT

ANGULAR PITCH DISPLACEMENT AT ONE SECOND AFTER CONTROL INPUT ~ DEGREES FROM TRIM



FORWARD AFT
LONGITUDINAL CYCLIC DISPLACEMENT ~ INCHES FROM TRIM



FORWARD AFT
LONGITUDINAL CYCLIC DISPLACEMENT ~ INCHES FROM TRIM

FIGURE NO 122

ANGULAR PITCH DISPLACEMENT

OH-6A USA S/N 62-[illegible]

SAE OFF

SYM	AIRSPEED (KCAS)	AVG HD (FT)	AVG GW (LB)	AVG CG (IN) LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	300	2640	105.40	1.30 LT	394	XM-8	HOVER (IGE)
□	35 KTS	4730	2605	104.95	1.30 LT	394	XM-8	LEVEL FLIGHT
△	92 KTS	4630	2580	104.85	1.30 LT	394	XM-8	LEVEL FLIGHT
◿	98 KTS	4900	2495	104.95 (AFT)	1.30 LT	394	XM-8	LEVEL FLIGHT

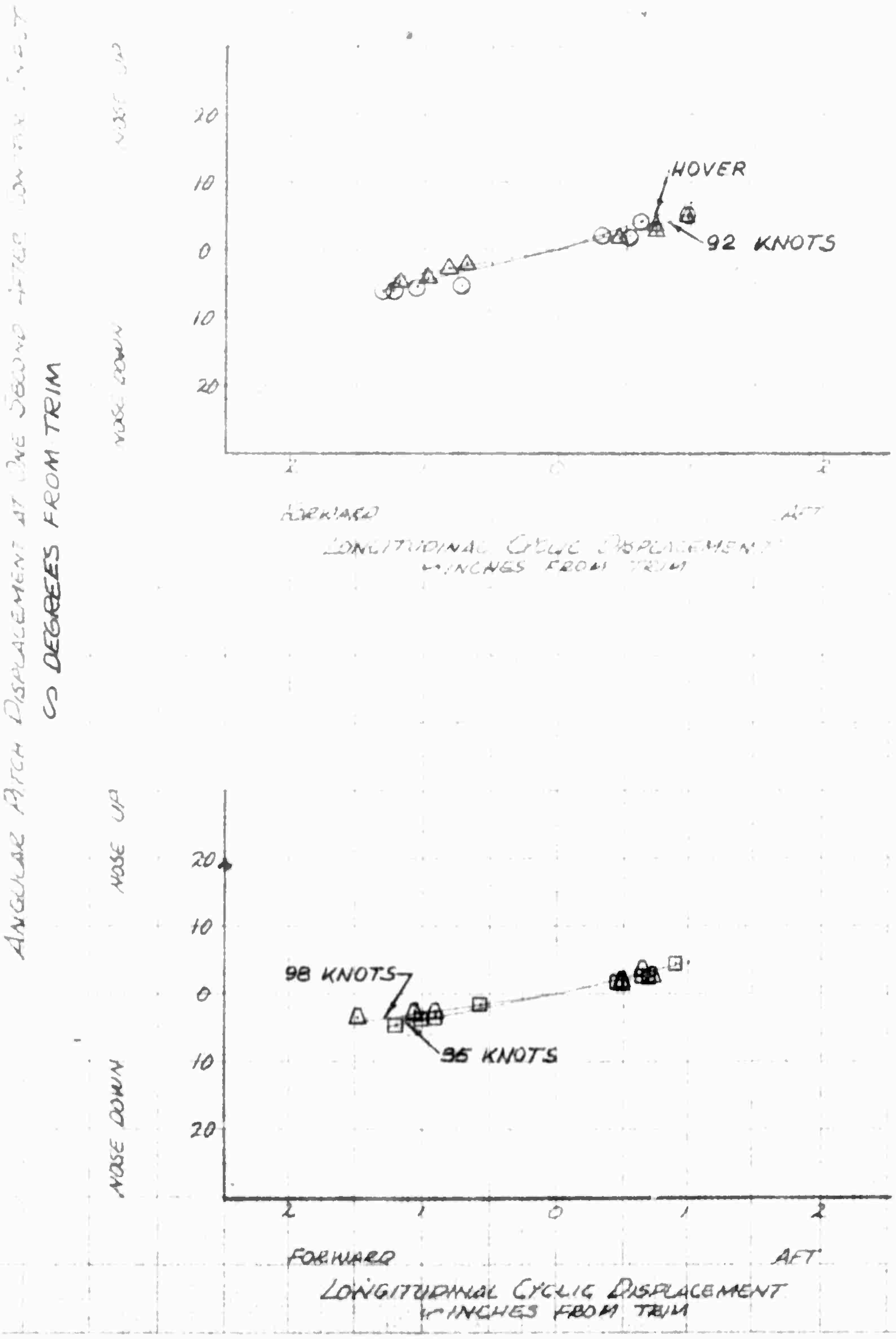


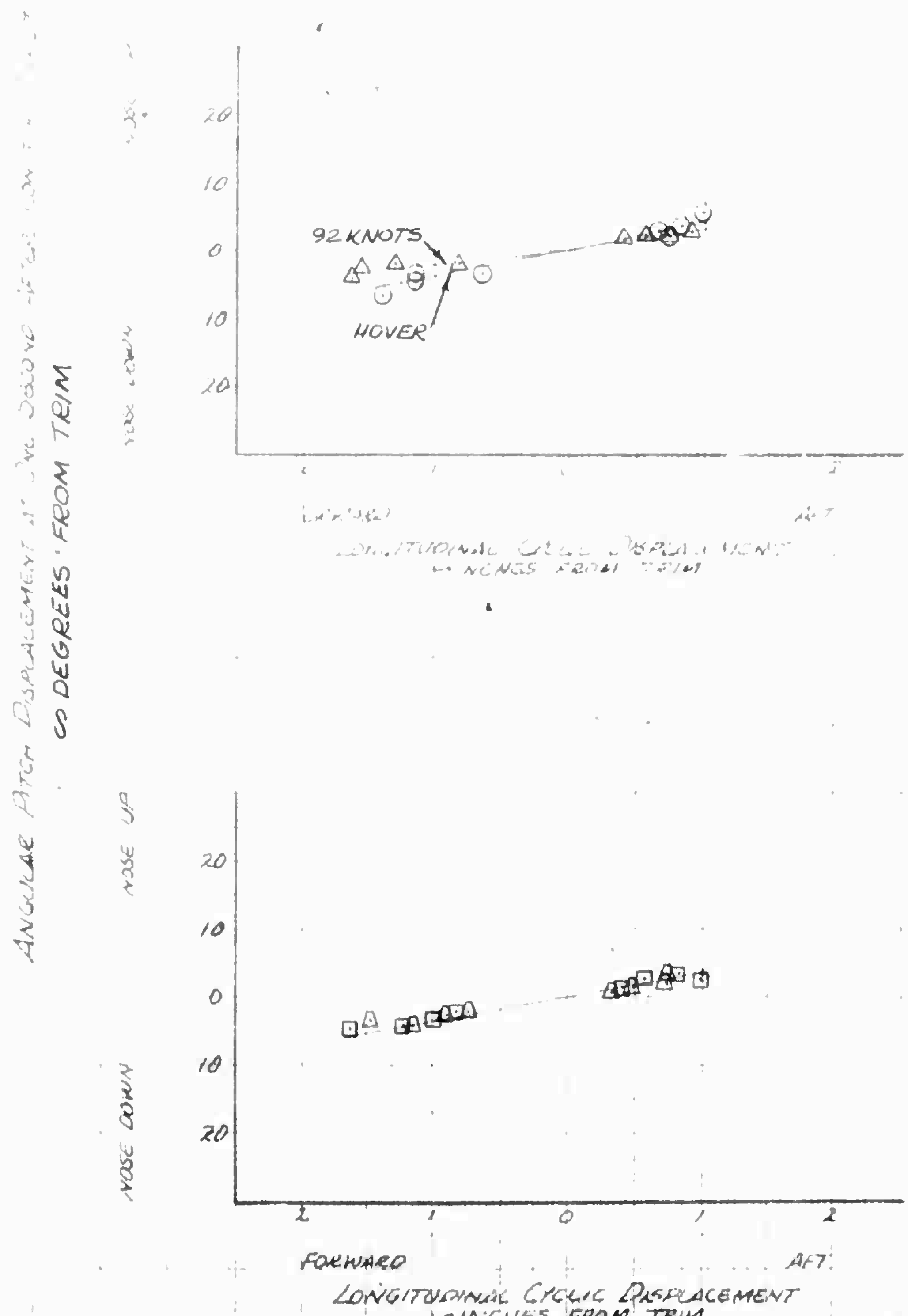
FIGURE NO 123

ANGULAR PITCH DISPLACEMENT

[illegible]

SAE ON

SYM	AIRSPEED KCAS	AVG HD FT	AVG GW LB	AVG CG IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	390	2650	105.40	1.30LT	394	XM-8	HOVER (IGE)
□	35 KTS	4885	2555	105.05	1.30LT	394	XM-8	LEVEL FLIGHT
△	42 KTS	4900	2535	105.00	1.30LT	394	XM-8	LEVEL FLIGHT
△	98 KTS	5020	2515	104.15 (AFT)	1.30LT	394	XM-8	LEVEL FLIGHT



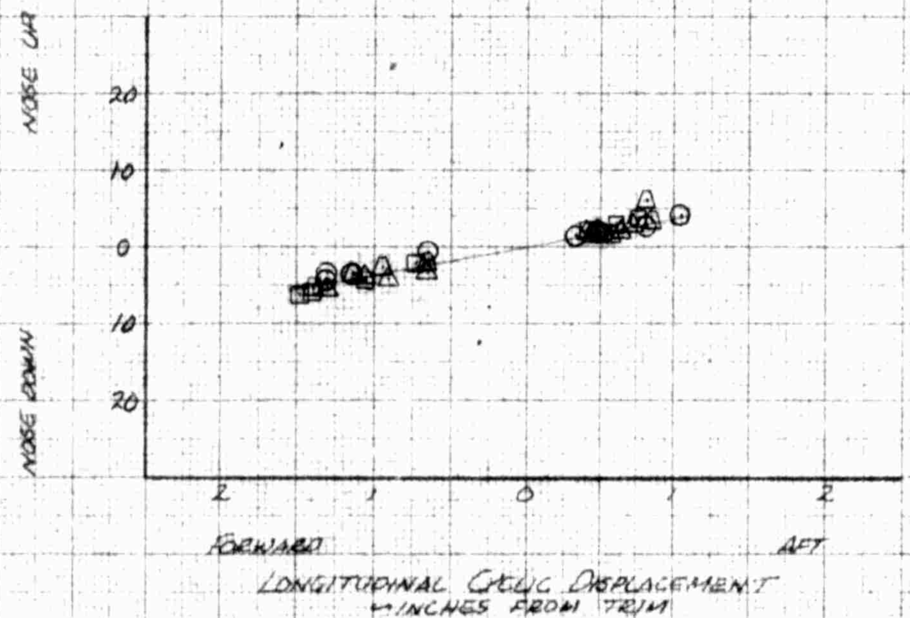
FOR OFFICIAL USE ONLY

FIGURE NO 124
ANGULAR PITCH DISPLACEMENT
OH-4A USA S/N 62-4204

SYM	AIRSPEED ~ CAS	AVG Hp ~ FT	AVG G.W. ~ LB	AVG CG ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION		FLT COND
○	45 KTS	5000	2600	105.20	1.30 LT	394	XM-8	SAE ON	NOTED
□	45 KTS	5000	2665	105.20	1.30 LT	394	XM-8	SAE OFF	NOTED
△	45 KTS	5000	2620	104.80	1.25 LT	394	XM-7	SAE ON	NOTED
△	45 KTS	5000	2586	104.60 (AFT)	1.25 LT	394	XM-7	SAE OFF	NOTED

ANGULAR PITCH DISPLACEMENT AT ONE SECOND AFTER CONTROL INPUT
~ DEGREES FROM TRIM

CLIMB



AUTOROTATION

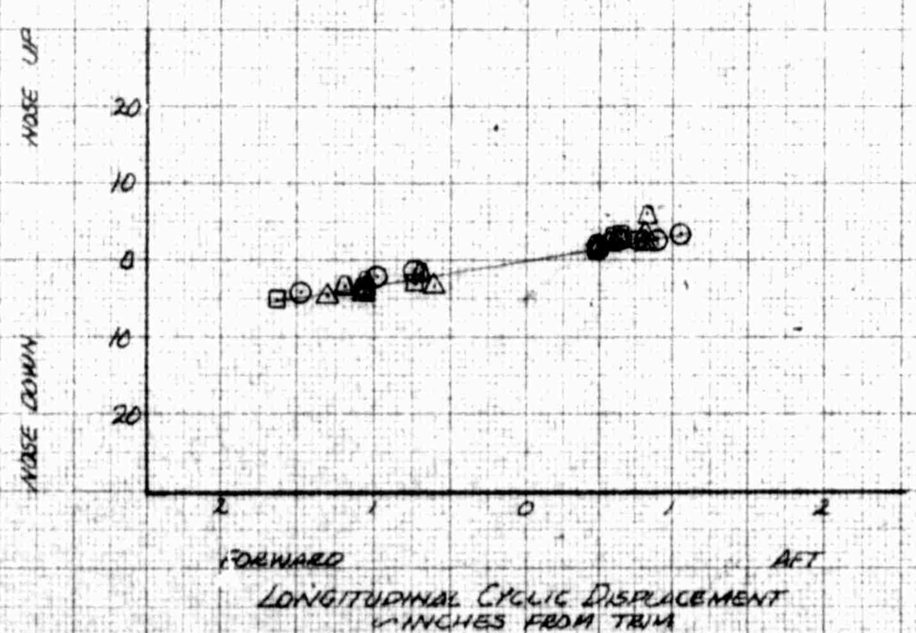


FIGURE NO. 125

SUMMARY OF LATERAL CONTROL SENSITIVITY

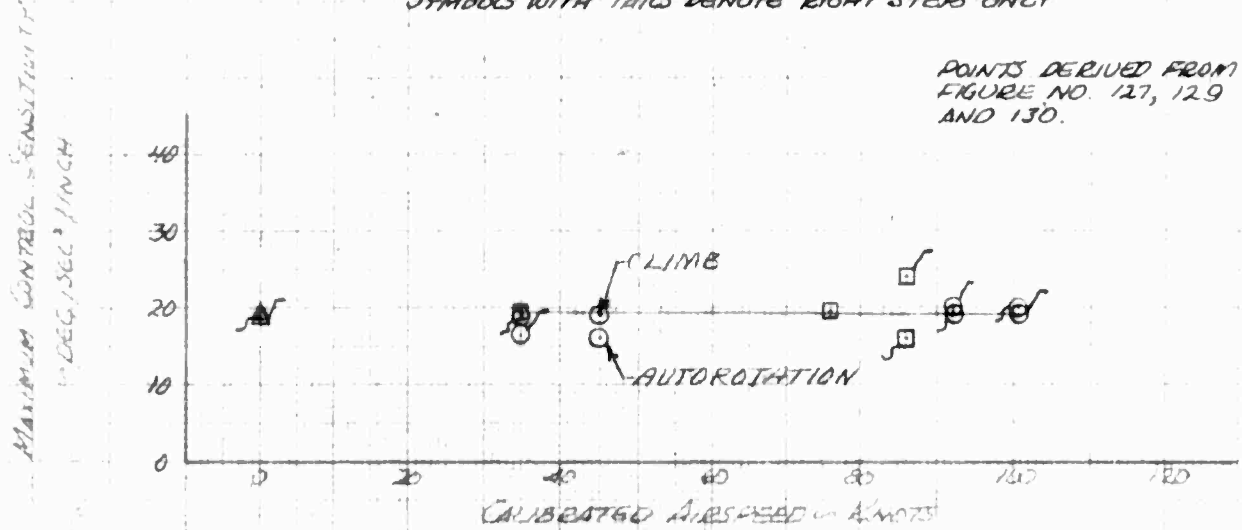
CH-4A USA S/N 62-4204

SAS OFF

SYM	AVG Hp ~FT	AVG G.W. ~LB	AVG CG ~ IN LONG.	LAT.	ROTOR RPM	CONFIGURATION	FLT COND.
△	780	2590	105.50	.35RT	394	CLEAN	HOVER (IGE)
○	5050	2565	105.40	.35RT	394	CLEAN	LEVEL FLIGHT AND NOTED
□	9940	2530	105.20 (AFT)	.35RT	394	CLEAN	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH LEFT AND RIGHT STEPS
SYMBOLS WITH FLAGS DENOTE LEFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE RIGHT STEPS ONLY

POINTS DERIVED FROM FIGURE NO. 127, 129 AND 130.



SYM	AVG Hp ~FT	AVG G.W. ~LB	AVG CG ~ IN LONG.	LAT.	ROTOR RPM	CONFIGURATION	FLT COND.
○	860	2845	104.70	.75LT	394	CLEAN	HOVER (IGE)
△	4915	2850	104.70 (AFT)	.75LT	394	CLEAN	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH LEFT AND RIGHT STEPS
SYMBOLS WITH FLAGS DENOTE LEFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE RIGHT STEPS ONLY

POINTS DERIVED FROM FIGURE NO. 128 AND 130

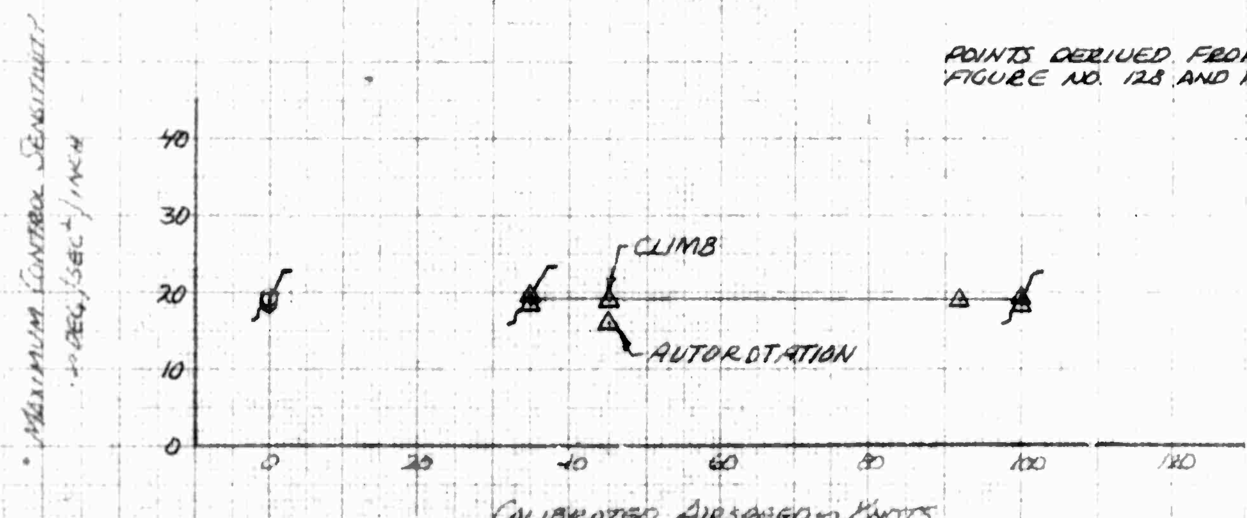
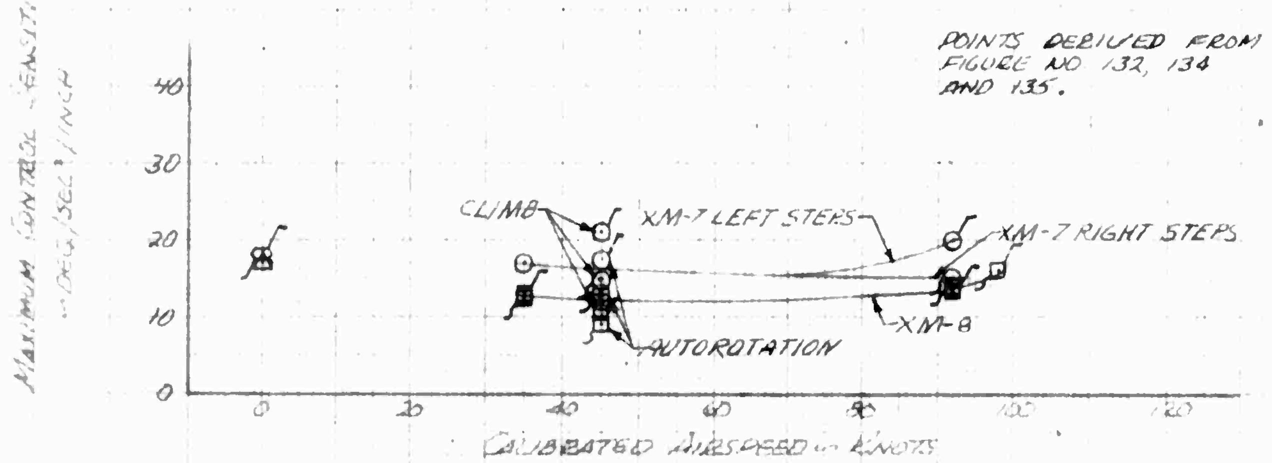


FIGURE NO. 126
SUMMARY OF LATERAL CONTROL SENSITIVITY
OH-4A USA S/N 62-4204

SYM	AVG Hp ~FT	AVG G.W ~LB	AVG CG ~IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
△	760	2535	104.45	1.25 LT	394	XM-7 SAE ON	HOVER (IGE)
⬭	300	2610	106.25	1.30 LT	394	XM-8 SAE ON	HOVER (IGE)
○	4860	2595	104.70	1.25 LT	394	XM-7 SAE ON	LEVEL FLIGHT AND NOTED
□	5030	2595	105.20 (AFT)	1.30 LT	394	XM-8 SAE ON	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH LEFT AND RIGHT STEPS
SYMBOLS WITH FLAGS DENOTE LEFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE RIGHT STEPS ONLY



SYM	AVG Hp ~FT	AVG G.W ~LB	AVG CG ~IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	760	2605	104.70	1.25 LT	394	XM-7 SAE OFF	HOVER (IGE)
□	630	2650	105.40	1.30 LT	394	XM-8 SAE OFF	HOVER (IGE)
△	4990	2590	104.60	1.25 LT	394	XM-7 SAE OFF	LEVEL FLIGHT AND NOTED
⬭	4965	2560	105.10 (AFT)	1.30 LT	394	XM-8 SAE OFF	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH LEFT AND RIGHT STEPS
SYMBOLS WITH FLAGS DENOTE LEFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE RIGHT STEPS ONLY

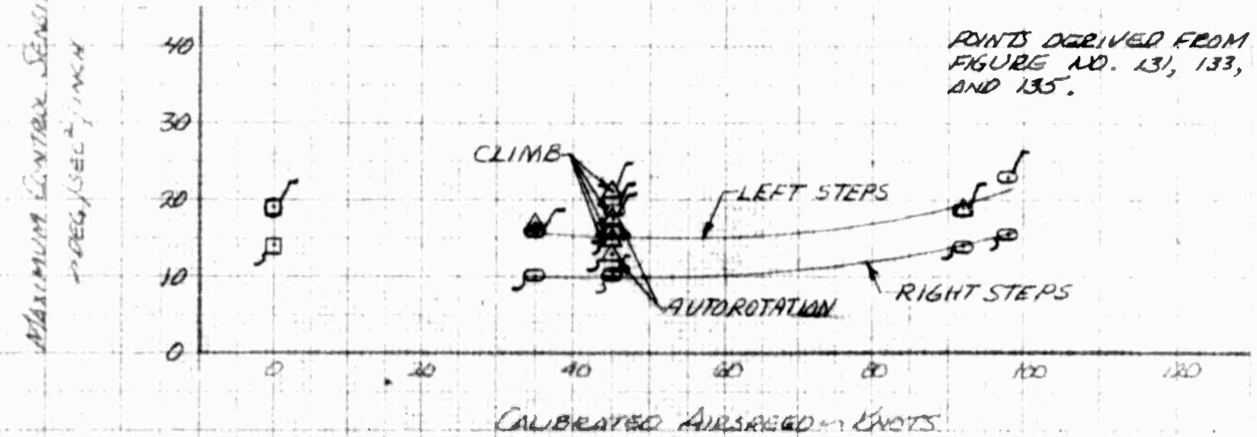
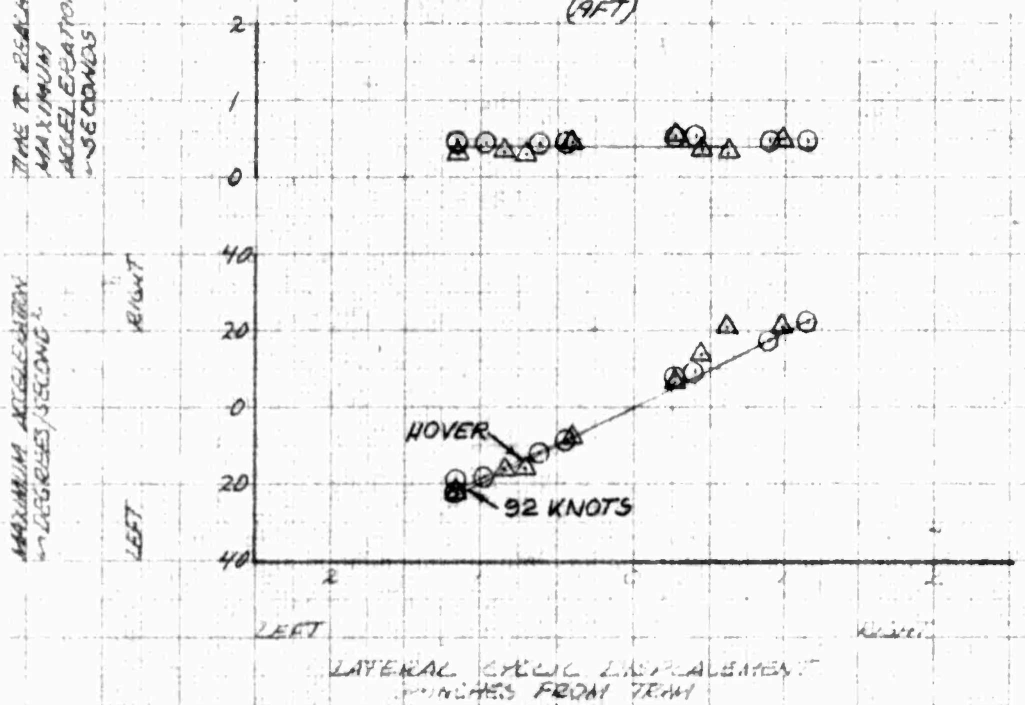


FIGURE No 127
LATERAL CONTROL SENSITIVITY
OH-4A USA S/N 62-4204
SAE OFF

SYM	AIRSPEED ~KCAS	AVG Hp ~FT	AVG G.W. ~LB	AVG C.G. ~IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	780	2590	105.50	.35 RT	394	CLEAN	HOVER (IGE)
□	35 KTS	5255	2535	105.40	.35 RT	394	CLEAN	LEVEL FLIGHT
△	92 KTS	5315	2505	105.20	.35 RT	394	CLEAN	LEVEL FLIGHT
◬	100.5 KTS	4670	2600	105.60 (9FT)	.35 RT	394	CLEAN	LEVEL FLIGHT



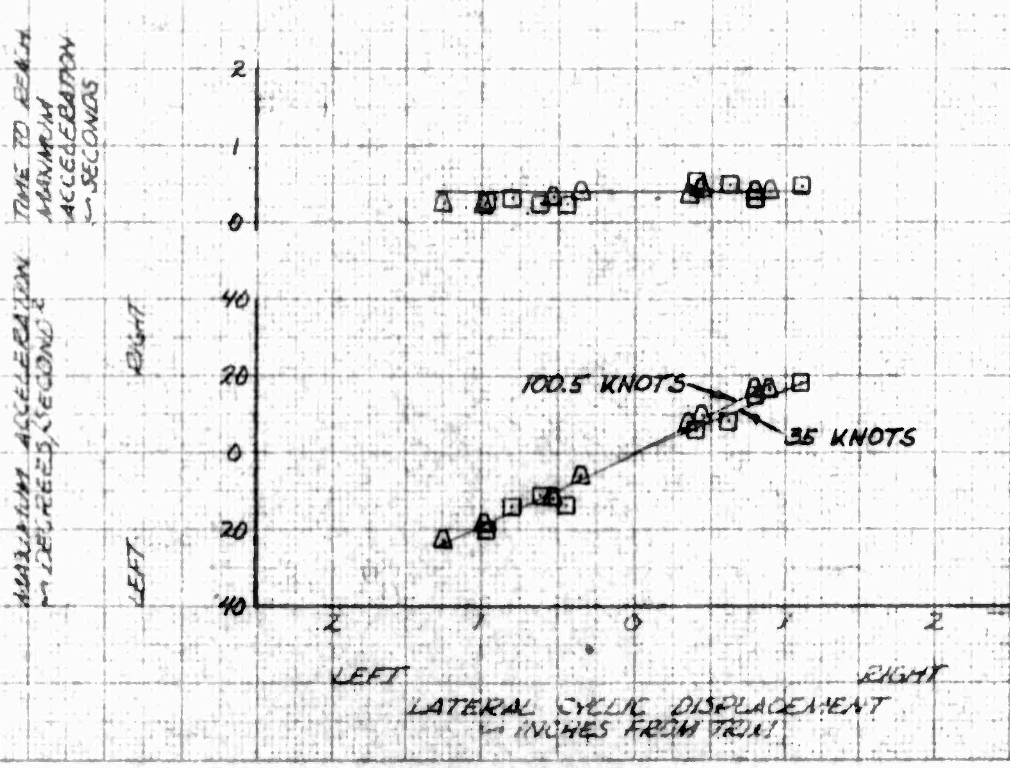


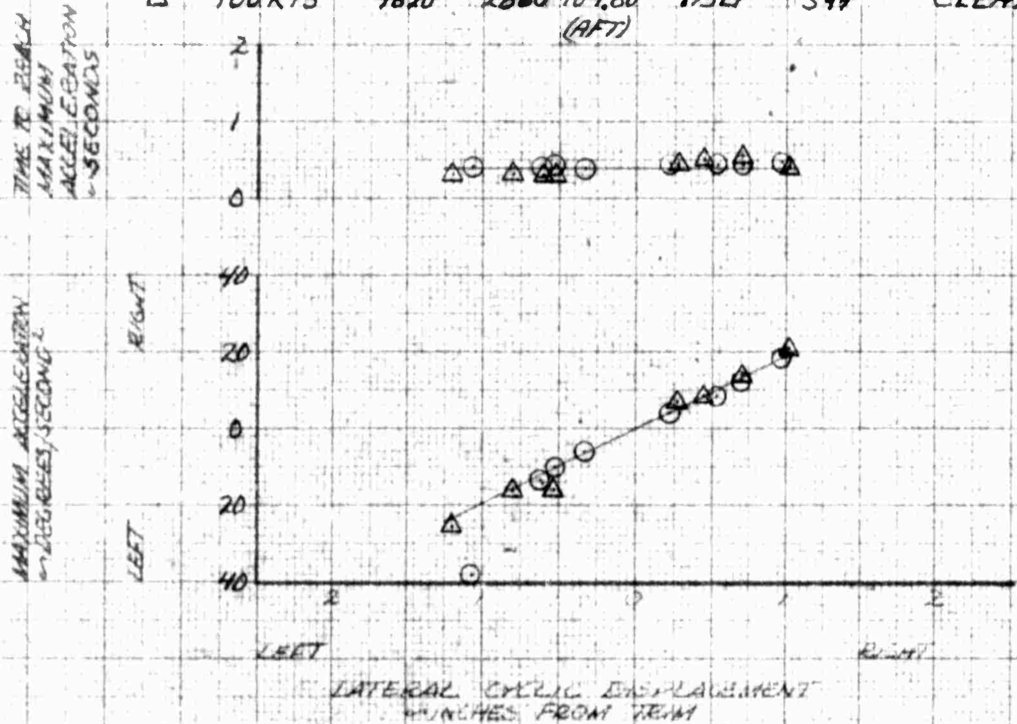
FIGURE NO 128

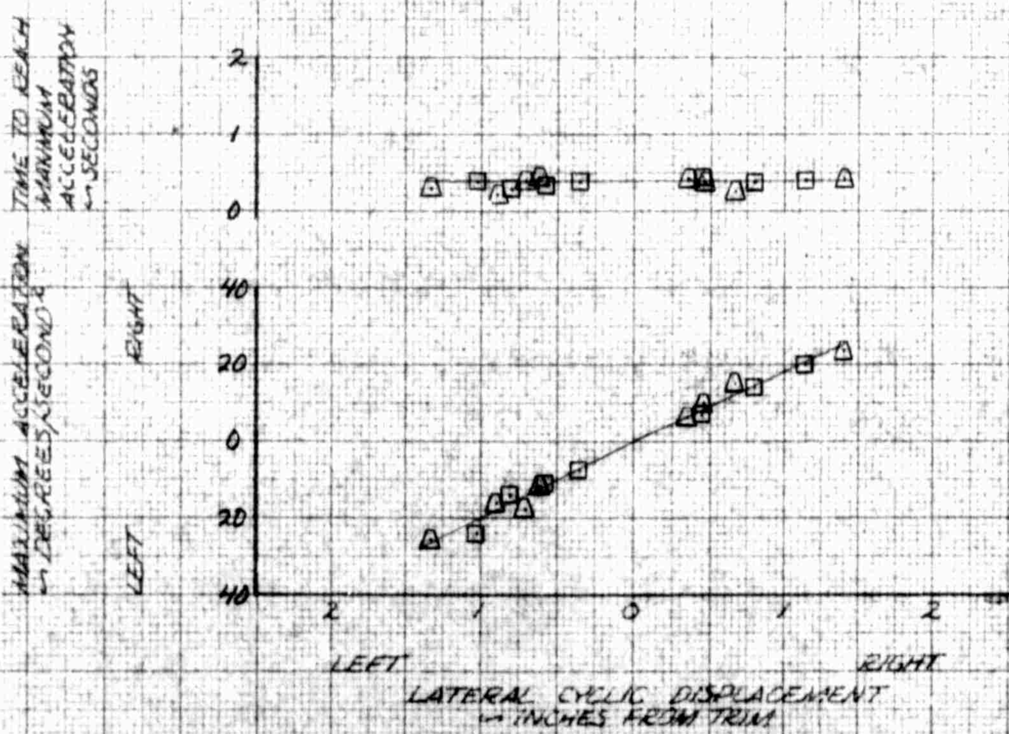
LATERAL CONTROL SENSITIVITY

OH-4A USA S/N 62-4204

SAE OFF

SYM	AIRSPEED ~KCAS	AVG H_p ~FT	AVG GW ~LB	AVG CG ~IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	860	2845	104.70	.75 LT	394	CLEAN	HOVER (IGE)
□	35 KTS	4715	2825	104.70	.75 LT	394	CLEAN	LEVEL FLIGHT
△	92 KTS	5030	2790	104.55	.75 LT	394	CLEAN	LEVEL FLIGHT
△	100 KTS	4820	2860	104.80 (AFT)	.75 LT	394	CLEAN	LEVEL FLIGHT





FOR OFFICAL USE ONLY

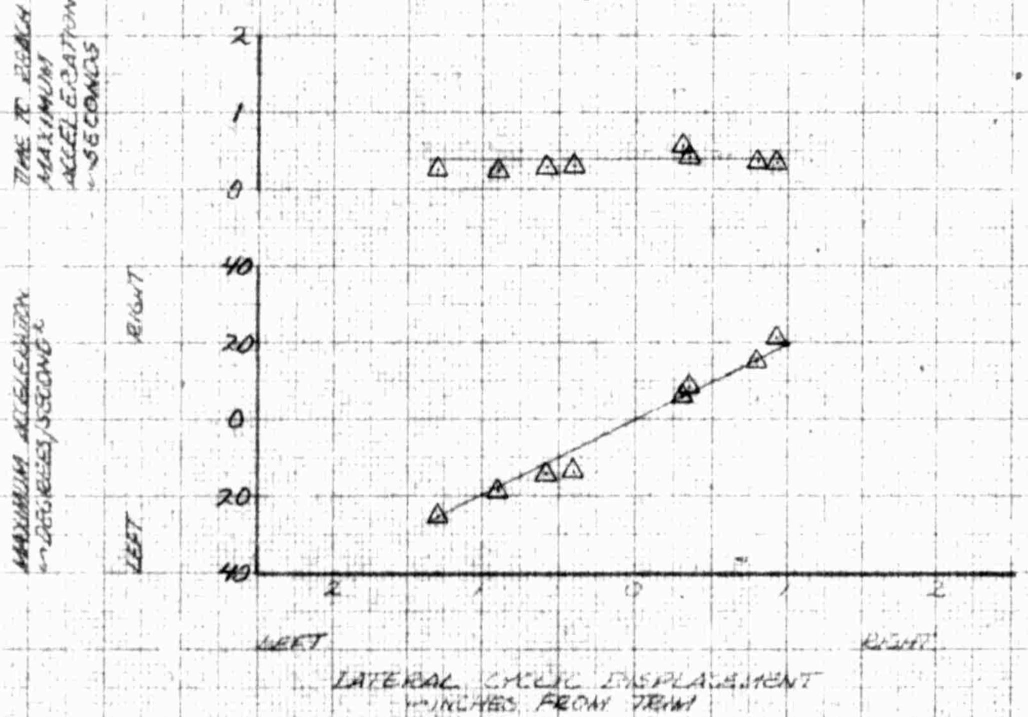
FIGURE NO. 129

LATERAL CONTROL SENSITIVITY

OH-4A USA S/N 62-4204

SAE OFF

SYM	AIRSPEED ~CAS	AVG H_p ~FT	AVG G.W. ~LB	AVG CG ~IN LONG	AVG CG ~IN LAT	ROTOR RPM	CONFIGURATION	FLT COND.
□	35 KTS	9995	2525	105.30	.35 RT	394	CLEAN	LEVEL FLIGHT
△	76 KTS	9840	2505	185.20	.35 RT	394	CLEAN	LEVEL FLIGHT
△	86 KTS	9870	2475	105.10 (AFT)	.35 RT	394	CLEAN	LEVEL FLIGHT



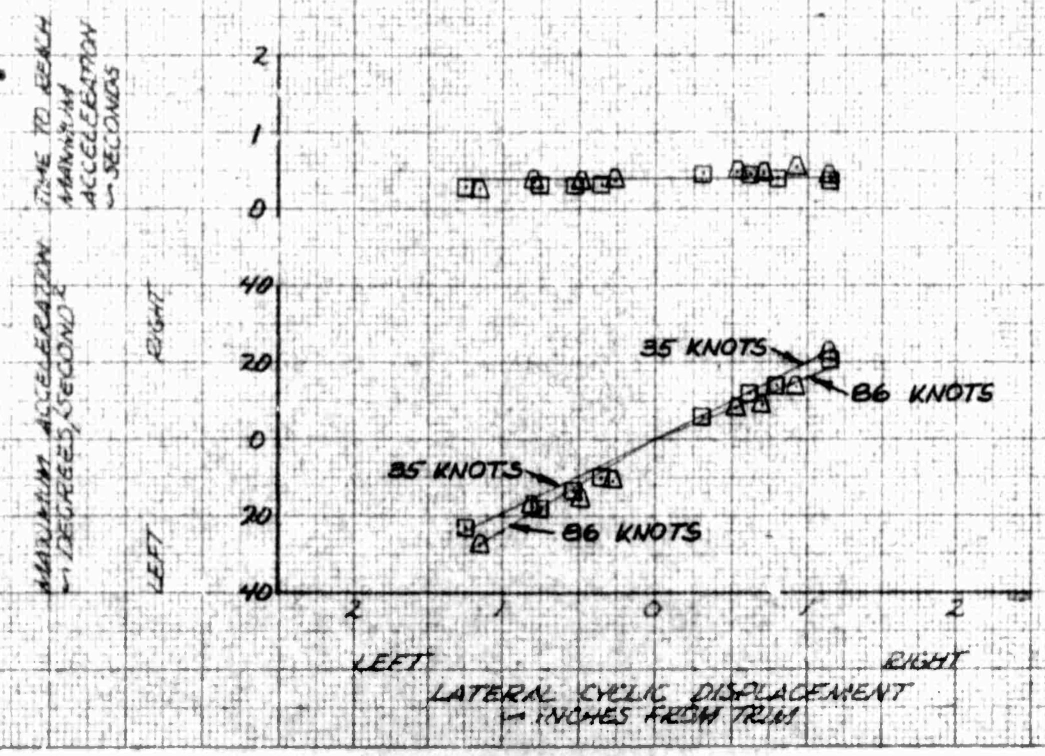
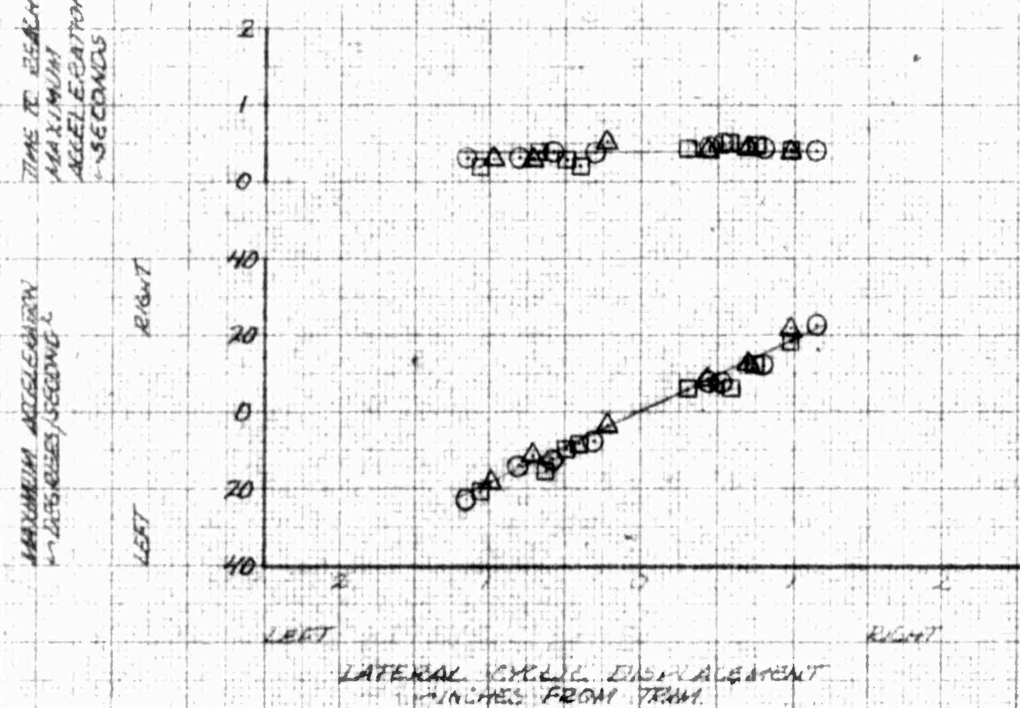


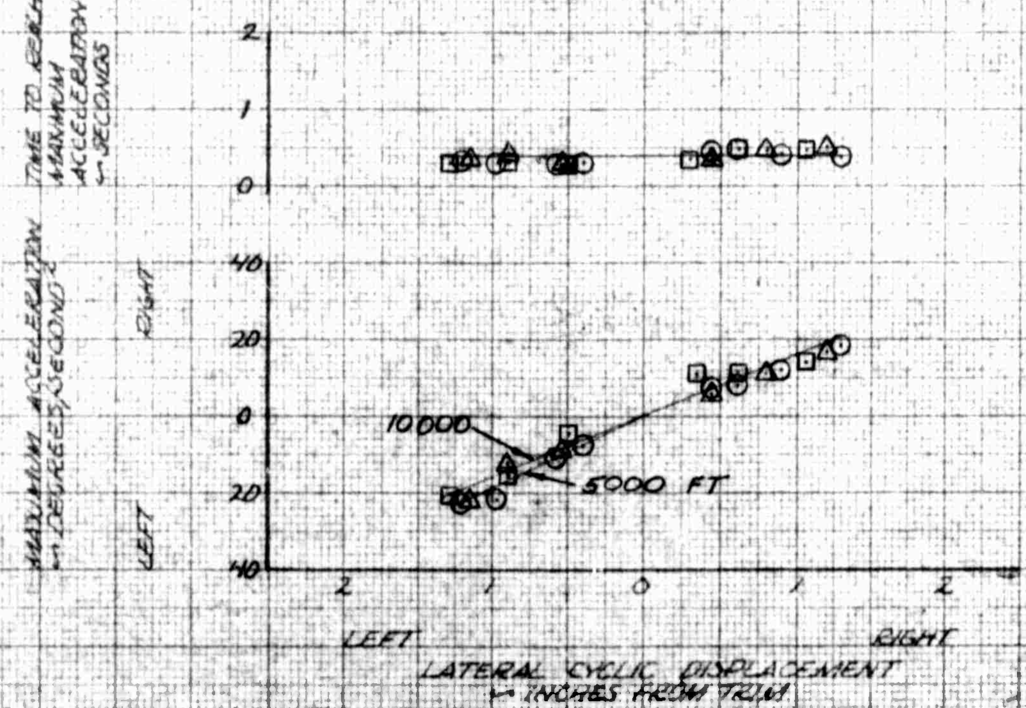
FIGURE NO 130
LATERAL CONTROL SENSITIVITY
OH-4A USA #62-4204
SAE OFF

SYM	AIRSPEED ~KCAS	AVG Hp ~FT	AVG G.W. ~LB	AVG CG ~IN LONG	AVG CG ~IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	45 KTS	5000	2600	105.70	.35 RT	394	CLEAN	NOTED
□	45 KTS	10000	2575	105.60	.35 RT	394	CLEAN	NOTED
△	45 KTS	5000	2895	105.05 (AFT)	.75 RT	394	CLEAN	NOTED

CLIMB



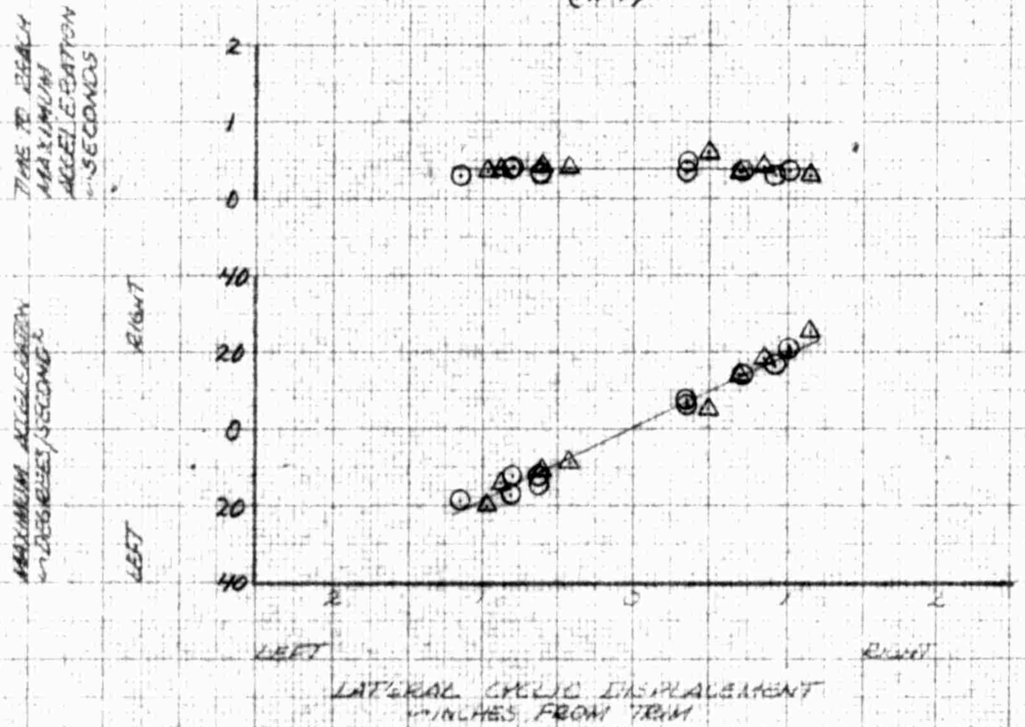
AUTOROTATION

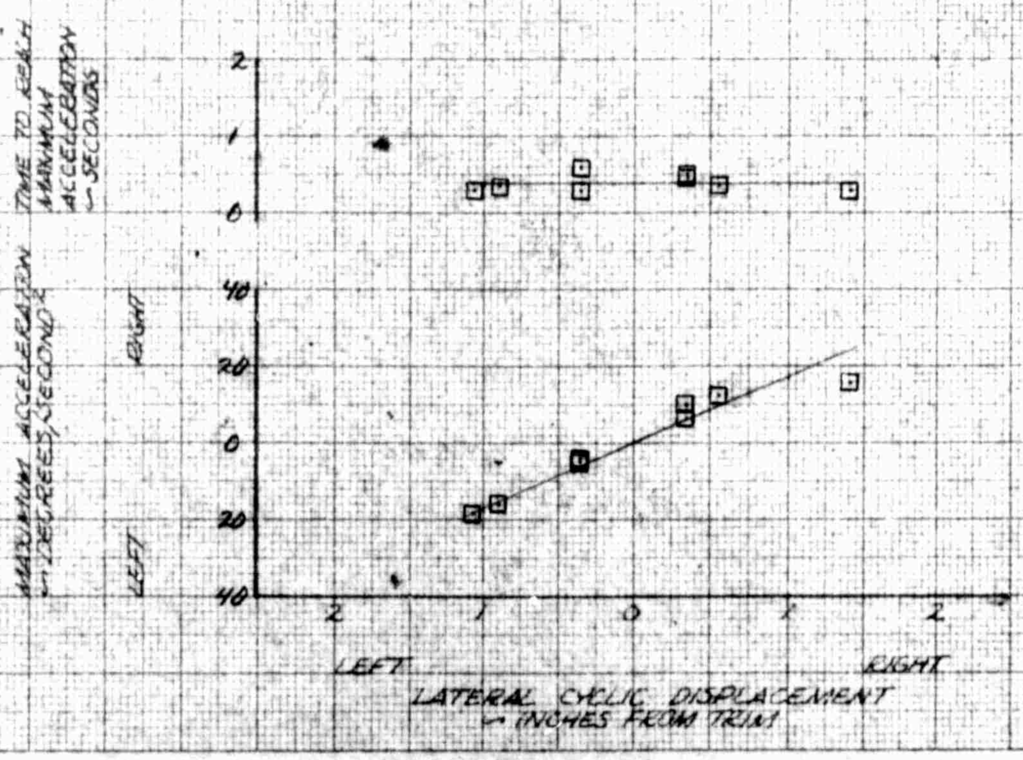


FOR OFFICAL USE ONLY

FIGURE No 131
LATERAL CONTROL SENSITIVITY
OH-4A USA #62-4204
SAE OFF

SYM	AIRSPEED ~CAS	AVG Hp ~FT	AVG G.W. ~LB	AVG CG ~IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND.
○	ZERO	740	2605	104.70	1.25LT	394	XM-7	HOVER (IGE.)
□	35 KTS	4945	2560	104.50	1.25LT	394	XM-7	LEVEL FLIGHT
△	92 KTS	5010	2580	104.60 (AFT)	1.25LT	394	XM-7	LEVEL FLIGHT

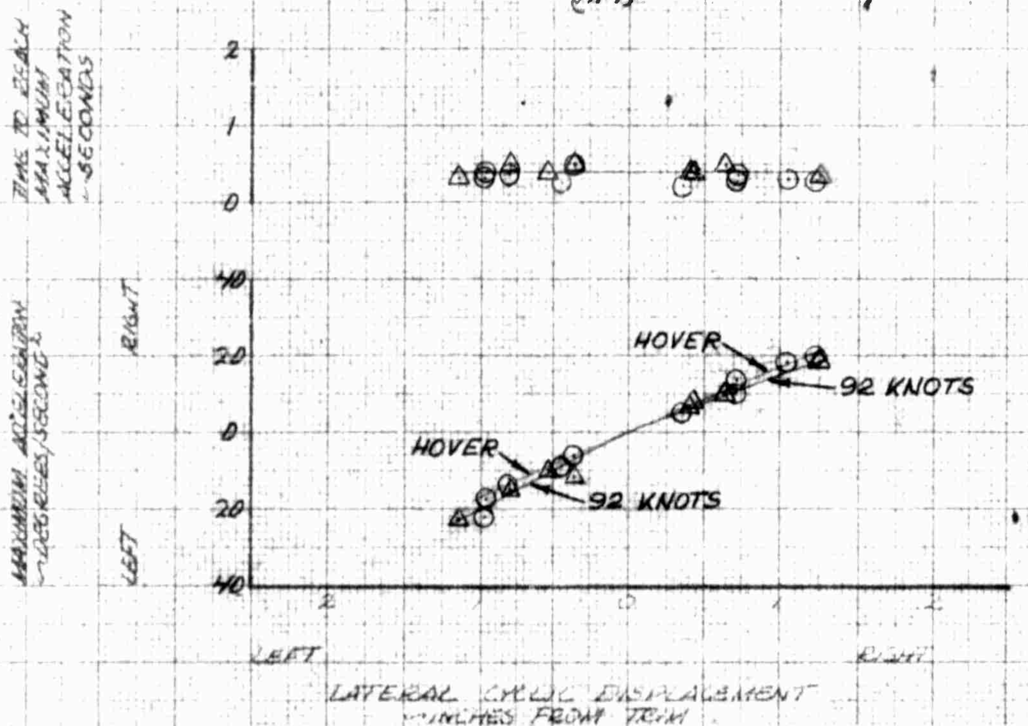




FOR OFFICAL USE ONLY

FIGURE NO 132
LATERAL CONTROL SENSITIVITY
OH-4A USA S/N 62-4204
SAE ON

SYM	AIRSPEED ~KCAS	AVG Hp ~FT	AVG G.W. ~LB	AVG CG ~IN LONG	AVG CG ~IN LAT	ROTOR RPM	CONFIGURATION	FLT COND.
○	ZERO	760	2535	104.45	1.25 LT	394	XM-7	HOVER (IGE)
□	35 KTS	4670	2545	104.50	1.25 LT	394	XM-7	LEVEL FLIGHT
△	92 KTS	4765	2605	104.70 (AFT)	1.25 LT	394	XM-7	LEVEL FLIGHT



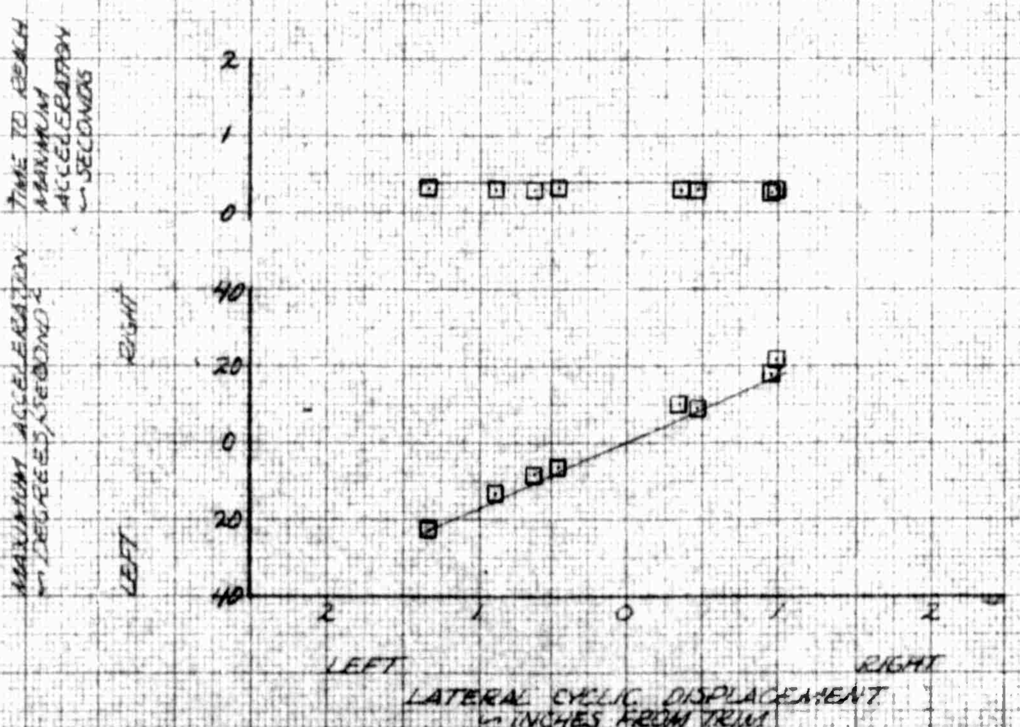


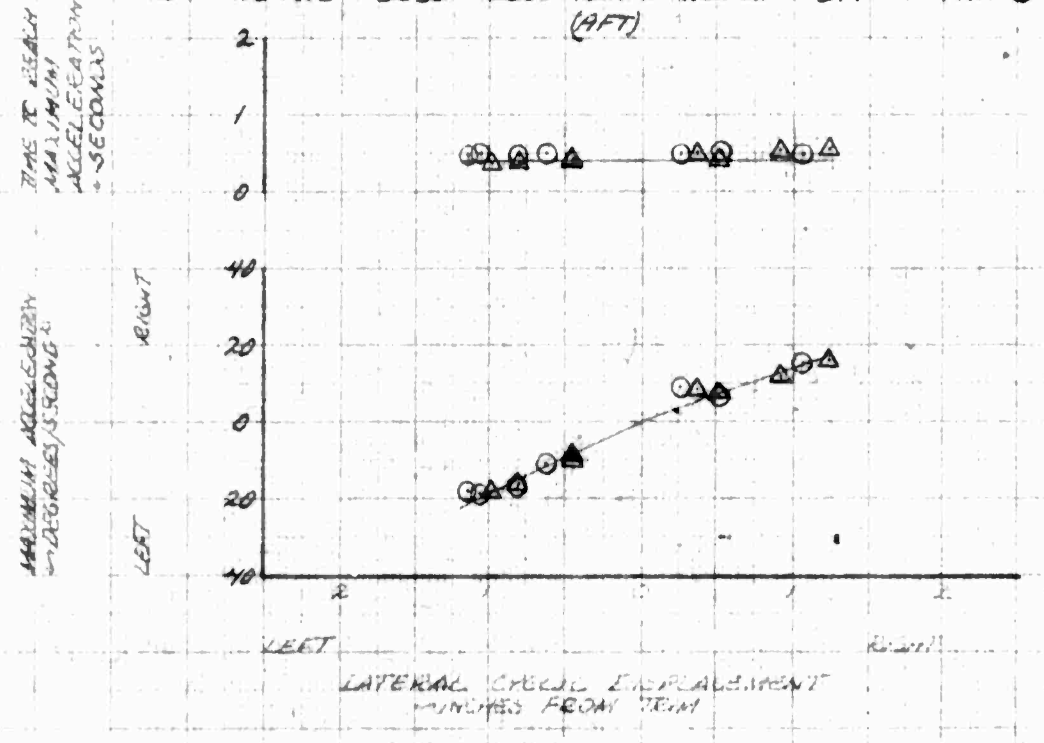
FIGURE NO 133

LATERAL CONTROL SENSITIVITY

OH-4A USA #62-4204

SAE OFF

SYM	AIRSPEED ~KCAS	AVG Hp ~FT	AVG G.W ~LB	AVG C.G ~IN LONG	AVG C.G ~IN LAT	ROTOR RPM	CONFIGURATION	FLT COND.
○	ZERO	630	2650	105.40	1.30LT	394	XM-8	HOVER (IGE)
□	35 KTS	5015	2555	105.05	1.30LT	394	XM-8	LEVEL FLIGHT
△	92 KTS	4770	2530	105.00	1.30LT	394	XM-8	LEVEL FLIGHT
△	98 KTS	5030	2505	104.95 (AFT)	1.30LT	394	XM-8	LEVEL FLIGHT



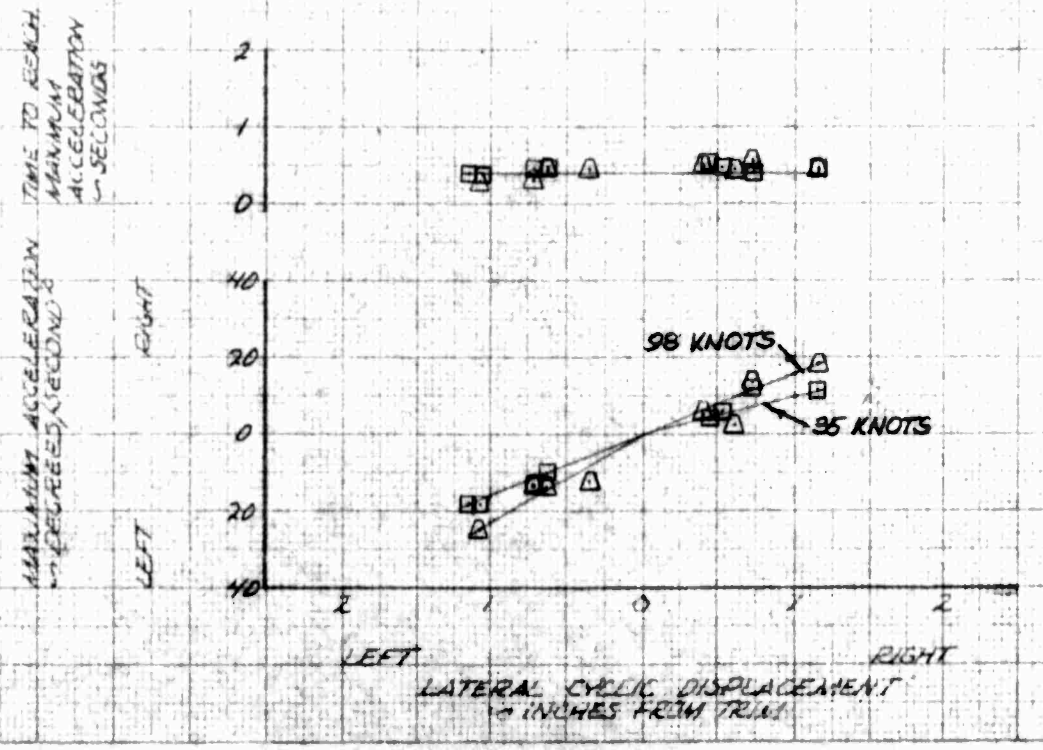


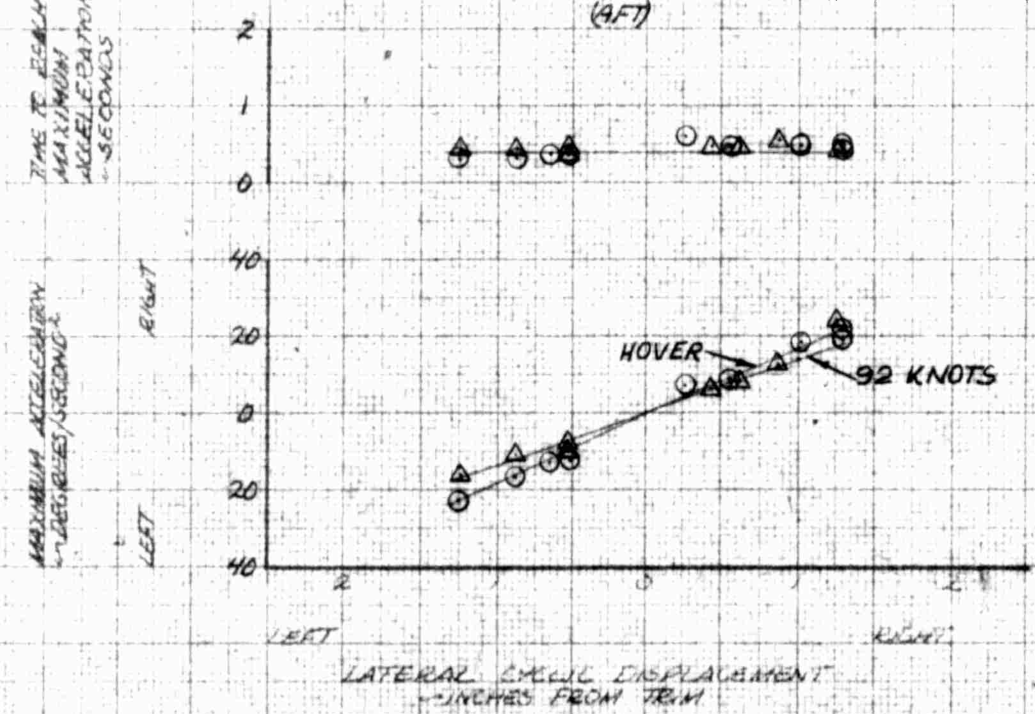
FIGURE NO 134

LATERAL CONTROL SENSITIVITY

CH-4A USA S/N 62-4204

SAE ON

SYM	AIRSPEED ~CAS	AVG H_p ~FT	AVG G.W. ~LB	AVG CG ~IN LONG	AVG CG ~IN LAT	ROTOR RPM	CONFIGURATION	FLT COND.
○	ZERO	300	2610	105.25	1.30 LT	394	XM-8	HOVER (IGE)
□	35 KTS	4490	2566	104.75	1.80 LT	394	XM-8	LEVEL FLIGHT
△	92 KTS	5445	2610	105.25	1.30 LT	394	XM-8	LEVEL FLIGHT
△	98 KTS	5220	2586	105.15 (AFT)	1.30 LT	394	XM-8	LEVEL FLIGHT



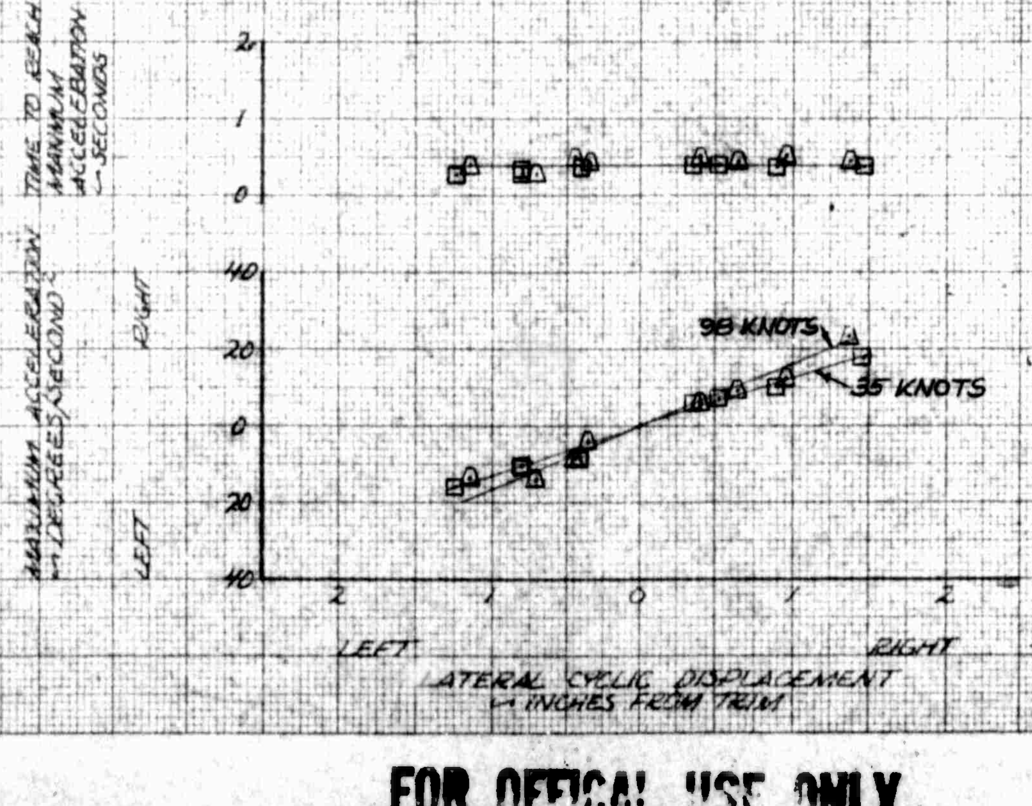
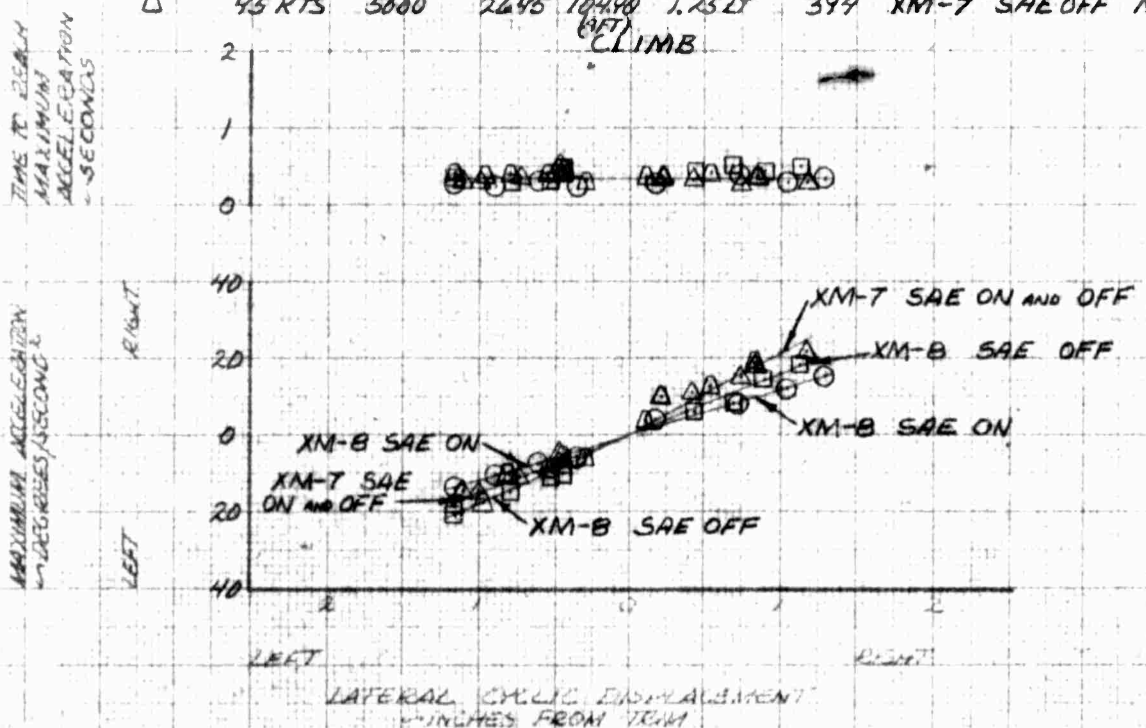
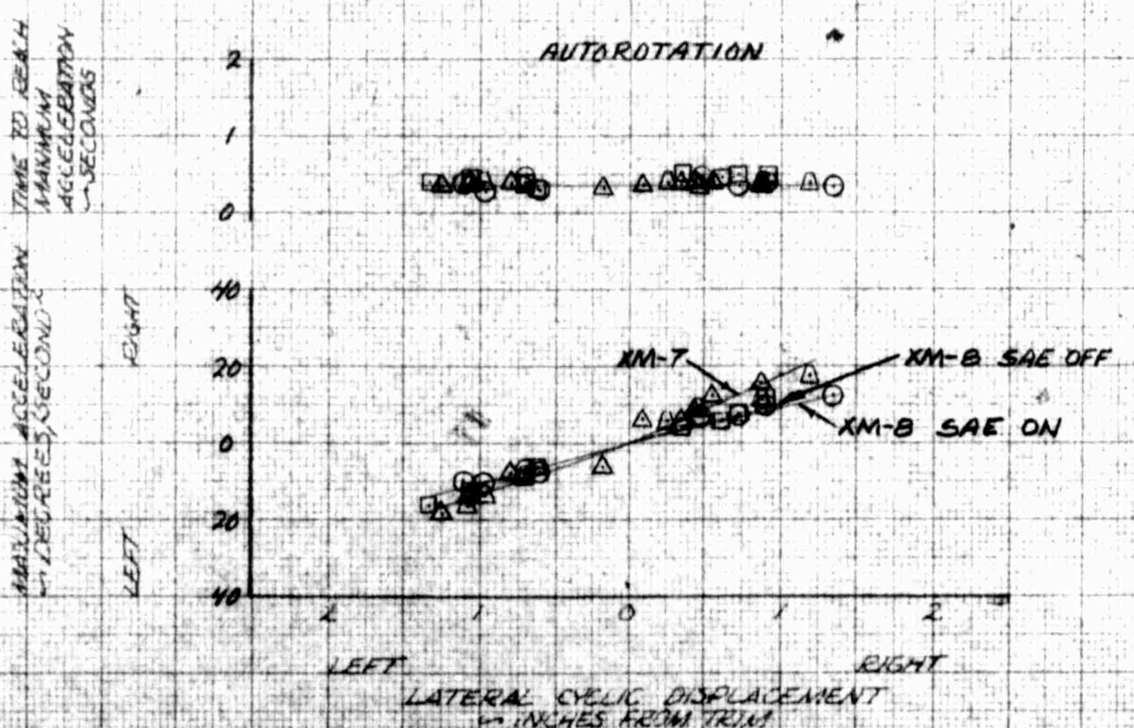


FIGURE NO 135
LATERAL CONTROL SENSITIVITY
OH-4A USA S/N 62-4204

SYM	AIRSPEED ~CAS	AVG H_P ~FT	AVG G.W. ~LB	AVG CG ~IN LONG	AVG CG ~IN LAT	ROTOR RPM	CONFIGURATION		FLT COND
○	45 KTS	5000	2615	105.00	1.30 LT	394	XM-8	SAE ON	NOTED
□	45 KTS	5000	2600	105.20	1.30 LT	394	XM-8	SAE OFF	NOTED
△	45 KTS	5000	2610	104.70	1.25 LT	394	XM-7	SAE ON	NOTED
△	45 KTS	5000	2645	104.90 (AFT)	1.25 LT	394	XM-7	SAE OFF	NOTED



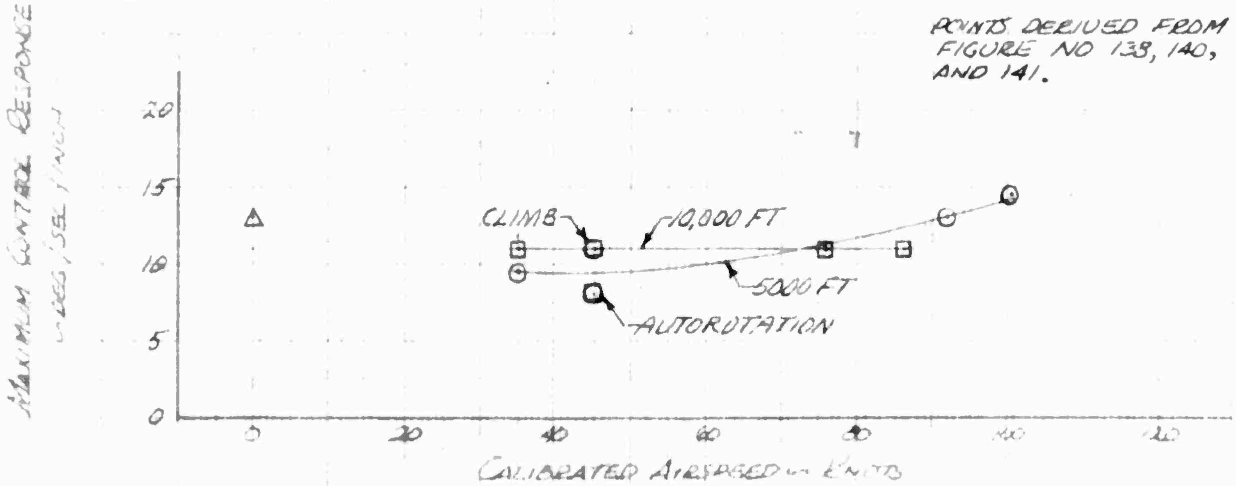


FOR OFFICAL USE ONLY

FIGURE NO. 136
SUMMARY OF LATERAL CONTROL RESPONSE
OH-4A USA S/N 62-4204
SAE-OFF

SYM	AVG Hp ~FT	AVG G.W ~LB	AVG C.G ~IN LONG	AVG C.G ~IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
△	780	2590	105.50	.35 RT	394	CLEAN	HOVER (IGE)
○	5050	2565	105.40	.35 RT	394	CLEAN	LEVEL FLIGHT AND NOTED
□	9940	2530	105.20 (AFT)	.35 RT	394	CLEAN	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH LEFT AND RIGHT STEPS
SYMBOLS WITH FLAGS DENOTE LEFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE RIGHT STEPS ONLY



SYM	AVG Hp ~FT	AVG G.W ~LB	AVG C.G ~IN LONG	AVG C.G ~IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	860	2845	104.70	.75 LT	394	CLEAN	HOVER (IGE)
△	4915	2850	104.70 (AFT)	.75 LT	394	CLEAN	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH LEFT AND RIGHT STEPS
SYMBOLS WITH FLAGS DENOTE LEFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE RIGHT STEPS ONLY

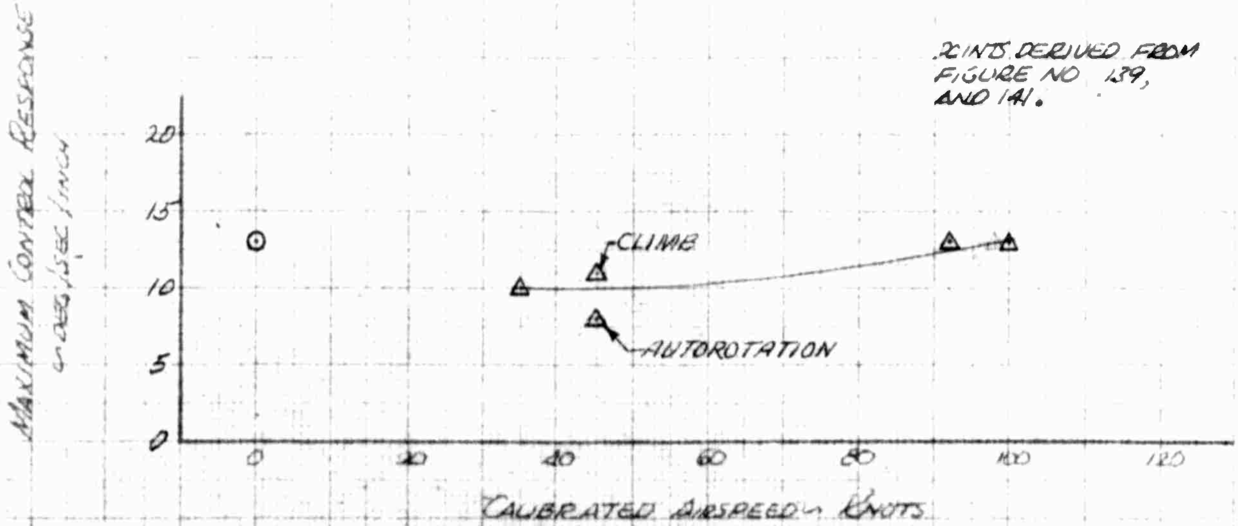


FIGURE NO. 137

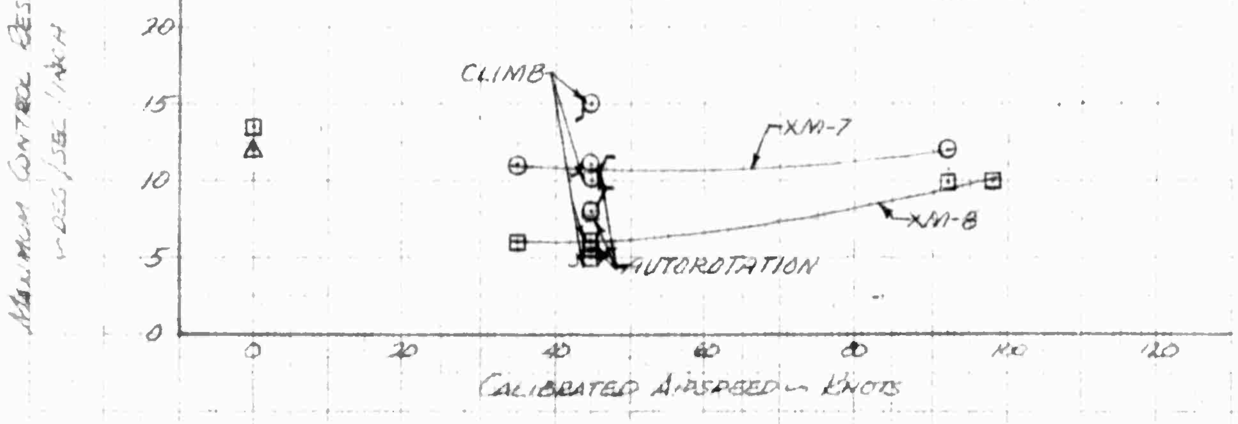
SUMMARY OF LATERAL CONTROL RESPONSE

OH-4A USA S/N 62-4204

SYM	AVG H_D ~FT	AVG G.W ~LB	AVG C.G ~ IN LONG	AVG C.G ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
△	760	2535	104.45	1.25 LT	394	XM-7 SAE ON	HOVER (IGE)
○	300	2610	105.25	1.30 LT	394	XM-8 SAE ON	HOVER (IGE)
○	4860	2595	104.70	1.25 LT	394	XM-7 SAE ON	LEVEL FLIGHT AND NOTED
□	5030	2595	105.20 (AFT)	1.30 LT	394	XM-8 SAE ON	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH LEFT AND RIGHT STEPS
SYMBOLS WITH FLAGS DENOTE LEFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE RIGHT STEPS ONLY

POINTS DERIVED FROM FIGURE NO 143, 145, AND 146.



SYM	AVG H_D ~FT	AVG G.W ~LB	AVG C.G ~ IN LONG	AVG C.G ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	760	2605	104.70	1.25 LT	394	XM-7 SAE OFF	HOVER (IGE)
□	630	2650	105.40	1.30 LT	394	XM-8 SAE OFF	HOVER (IGE)
△	4990	2590	104.60	1.25 LT	394	XM-7 SAE OFF	LEVEL FLIGHT AND NOTED
○	4965	2560	105.10 (AFT)	1.30 LT	394	XM-8 SAE OFF	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH LEFT AND RIGHT STEPS
SYMBOLS WITH FLAGS DENOTE LEFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE RIGHT STEPS ONLY

POINTS DERIVED FROM FIGURE NO. 142, 144, AND 146.

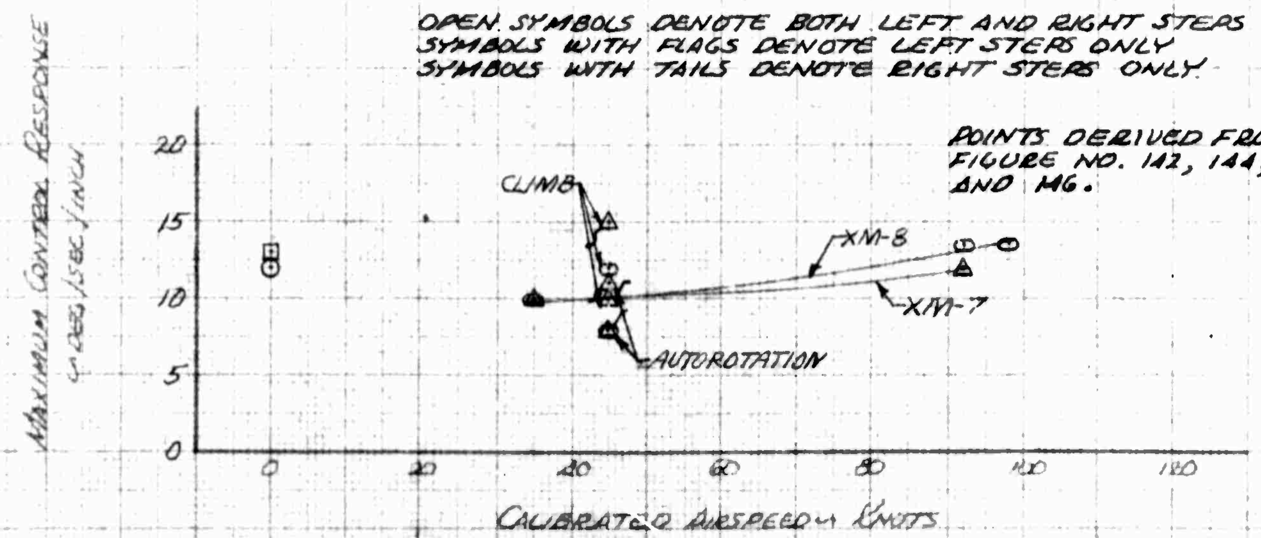
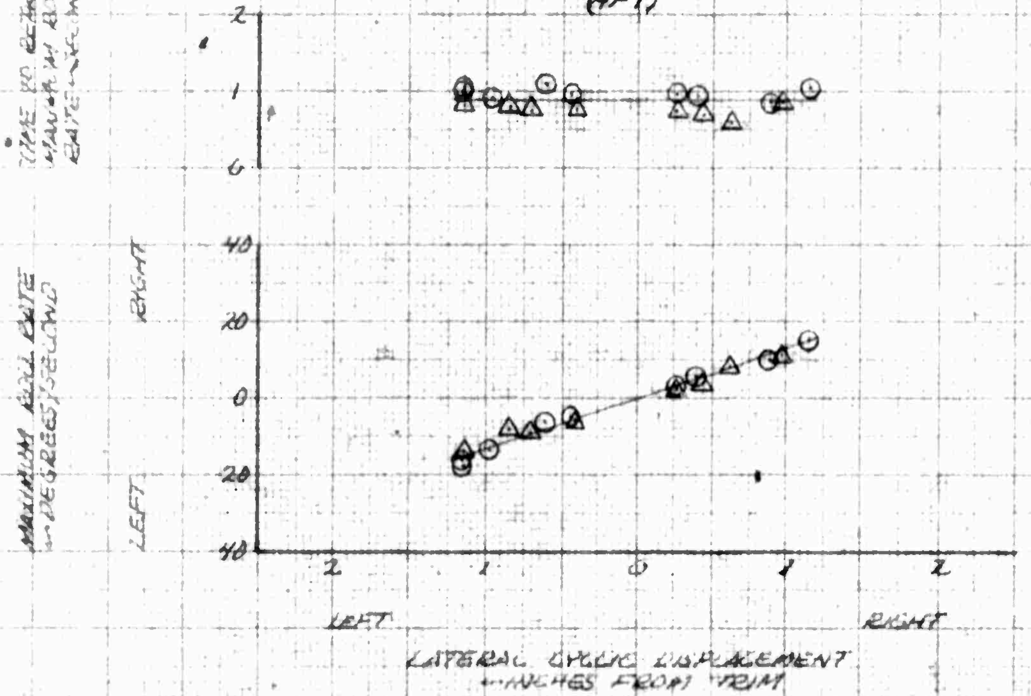


FIGURE NO 138
LATERAL CONTROL RESPONSE
OH-4A USA S/N 62-4204
SAE OFF

SYM	AIRSPEED ~ CAS	AVG Hp ~ FT	AVG G.W. ~ LB	AVG C.G. ~ IN LONG	C.G. ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	780	2590	105.50	.35 RT	394	CLEAN	HOVER (IGE)
□	35 KTS	5255	2535	105.40	.35 RT	394	CLEAN	LEVEL FLIGHT
△	92 KTS	5375	2505	105.20	.35 RT	394	CLEAN	LEVEL FLIGHT
△	100.5 KTS	4670	2600	105.60 (AFT)	.35 RT	394	CLEAN	LEVEL FLIGHT



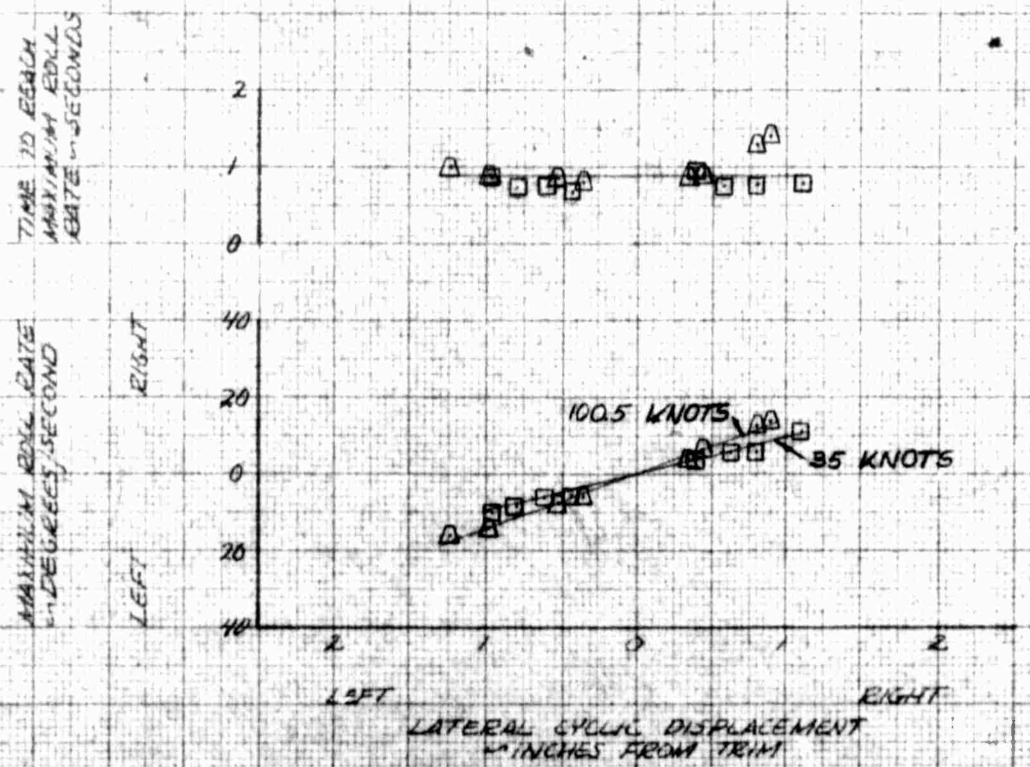
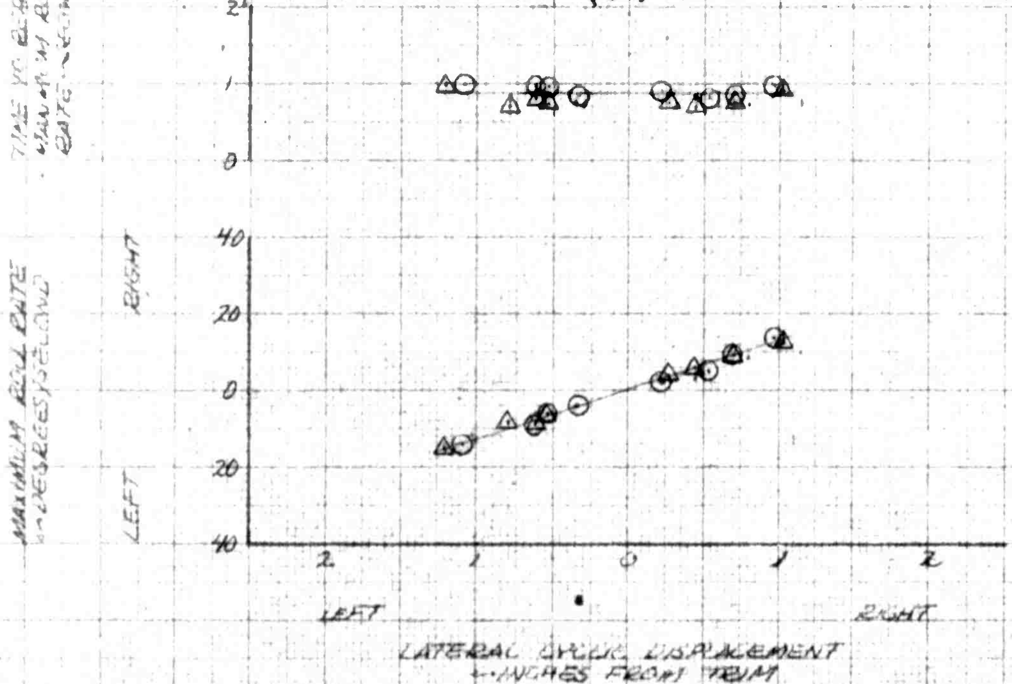


FIGURE NO 139
LATERAL CONTROL RESPONSE
OH-4A USA S/N 62-4204
SAE OFF

SYM	AIRSPEED ~KCAS	AVG HD ~FT	AVG GW ~LB	AVG LONG	CG ~IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	5860	2845	104.70	.75 LT	394	CLEAN	HOVER (IGE)
□	35 KTS	4715	2825	104.70	.75 LT	394	CLEAN	LEVEL FLIGHT
△	92 KTS	5030	2790	104.55	.75 LT	394	CLEAN	LEVEL FLIGHT
△	100 KTS	4820	2860	104.80 (AFT)	.75 LT	394	CLEAN	LEVEL FLIGHT



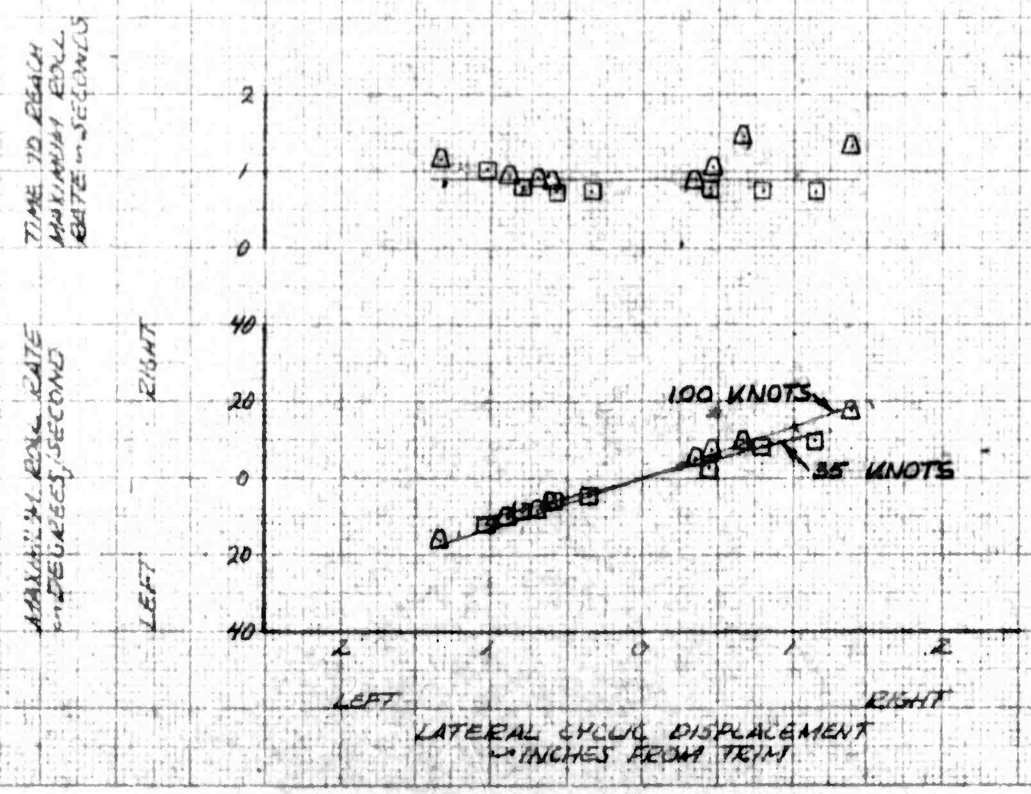
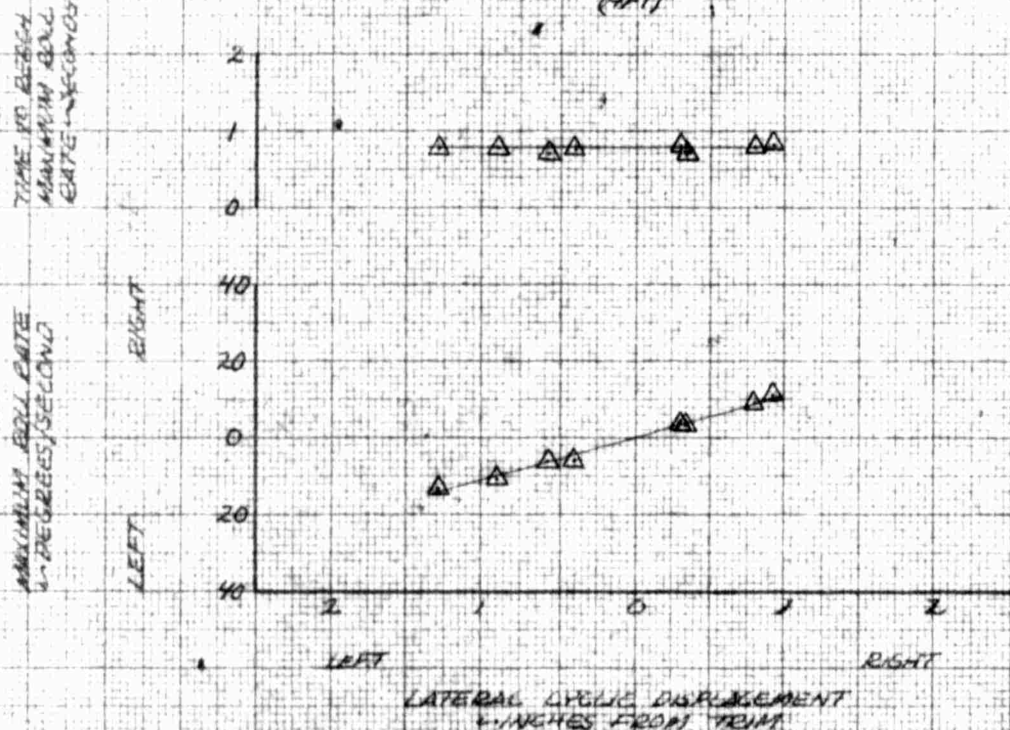
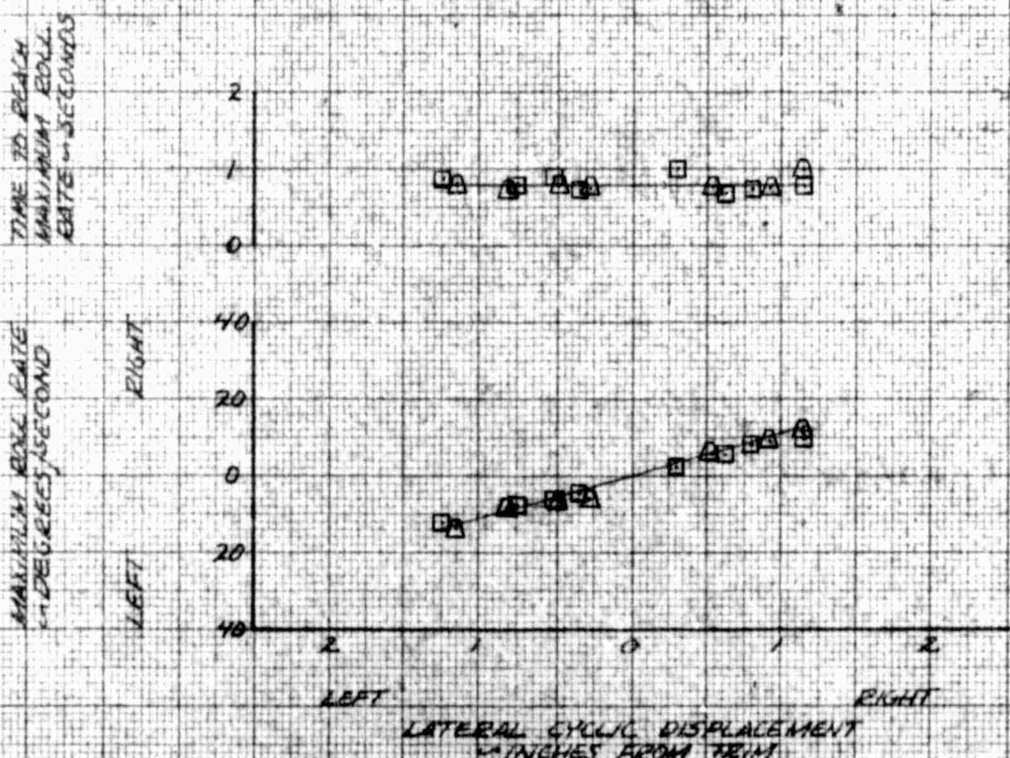


FIGURE NO 140
LATERAL CONTROL RESPONSE
OH-4A USA S/N 62-4204
SAE OFF

SYM	AIRSPEED ~CAS	AVG H_D ~FT	AVG G.W. ~LB	AVG C.G. ~IN LONG	AVG C.G. ~IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
□	35 KTS	9995	2525	105.30	.35 RT	394	CLEAN	LEVEL FLIGHT
△	76 KTS	9840	2505	105.20	.35 RT	394	CLEAN	LEVEL FLIGHT
⏃	86 KTS	9870	2475	105.10	.35 RT	394	CLEAN	LEVEL FLIGHT
				(AFT)				



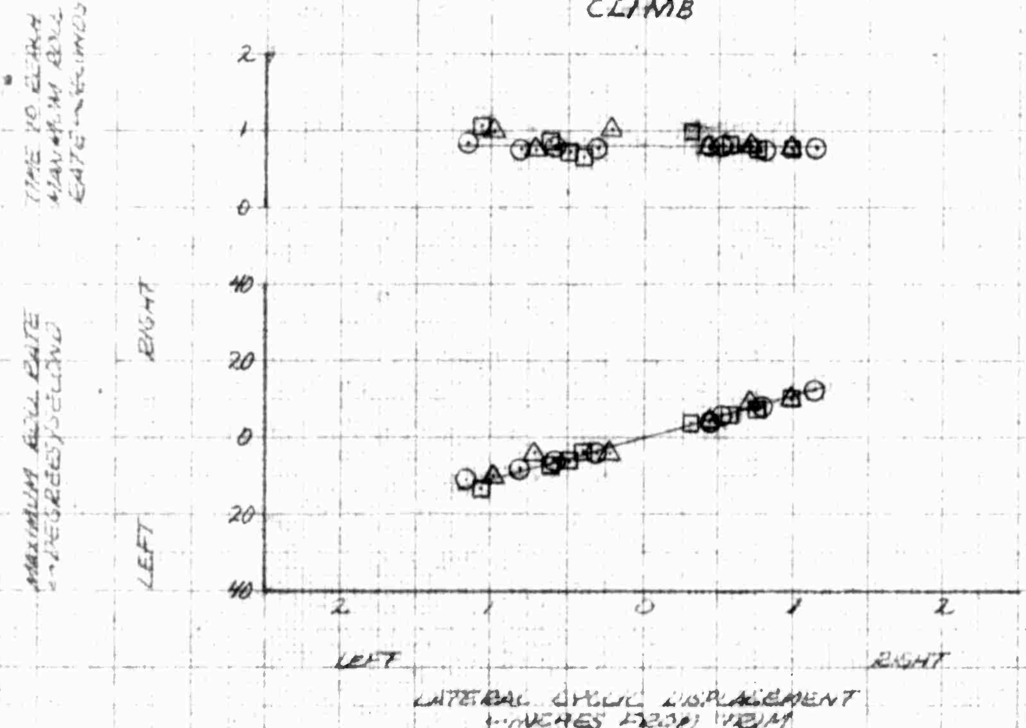


FOR OFFICAL USE ONLY

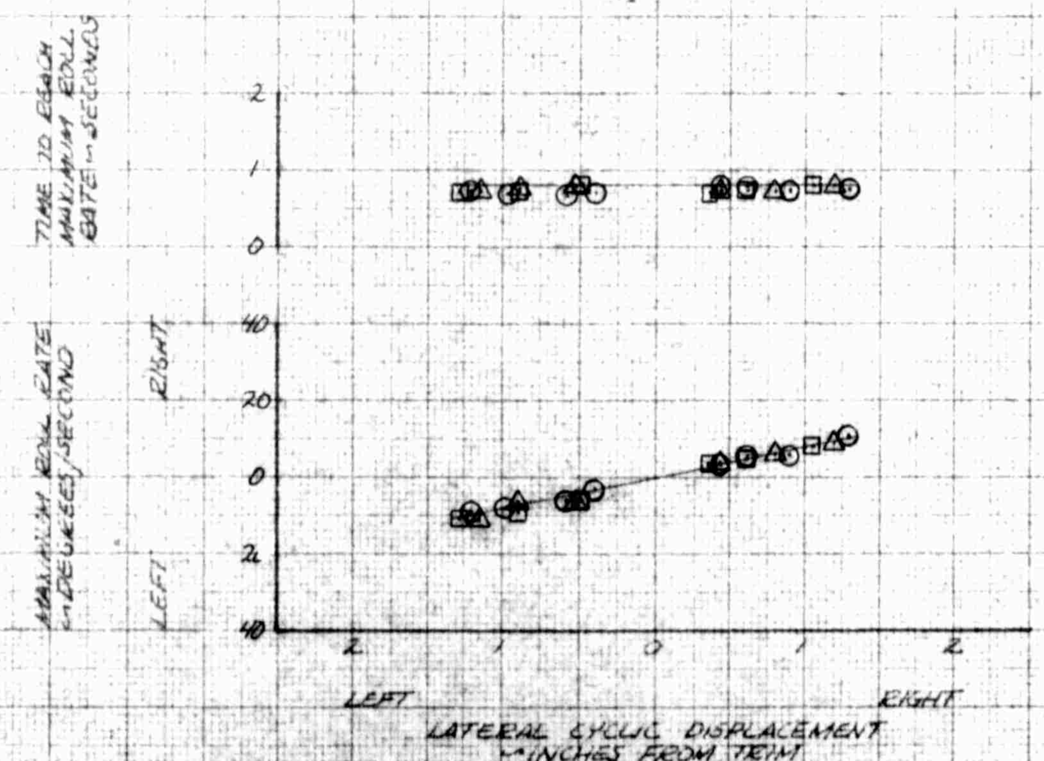
LATERAL CONTROL RESPONSE
OH-4A USA S/N 62-4204
SAE OFF

SYM	AIRSPEED ~KCAS	AVG HD ~FT	AVG GW ~LB	AVG C.G. ~IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	45KTS	5000	2600	105.70	.35RT	394	CLEAN	NOTED
□	45KTS	10000	2575	105.60	.35RT	394	CLEAN	NOTED
△	45KTS	5000	2895	105.05 (AFT)	.75LT	394	CLEAN	NOTED

CLIMB



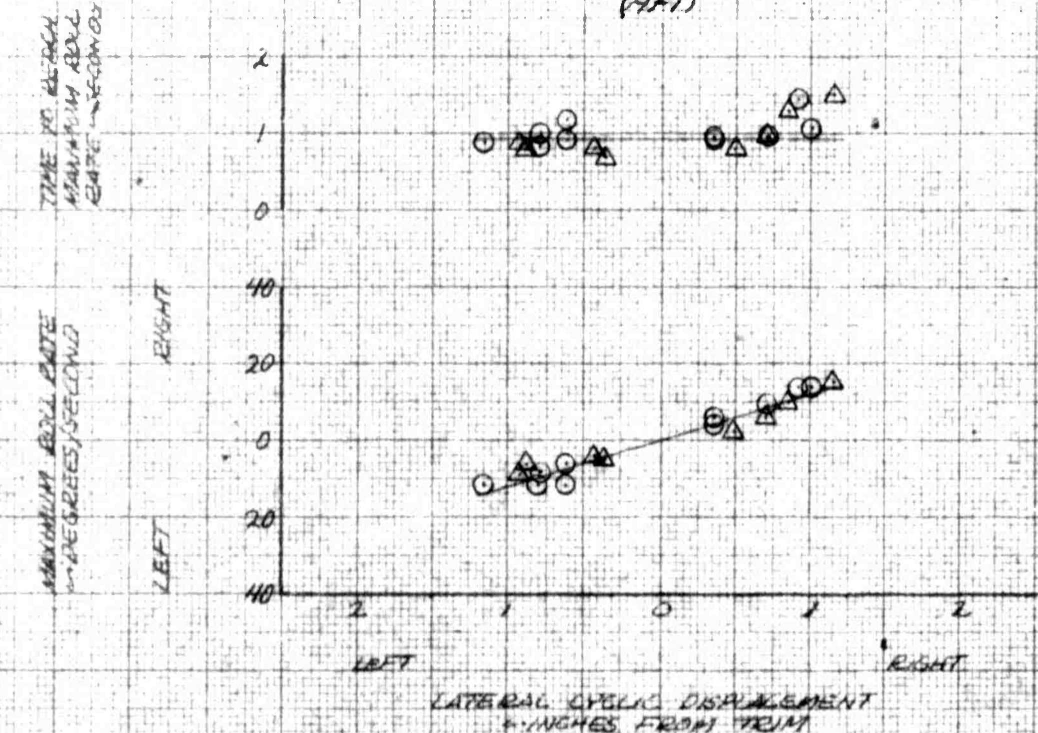
AUTOROTATION

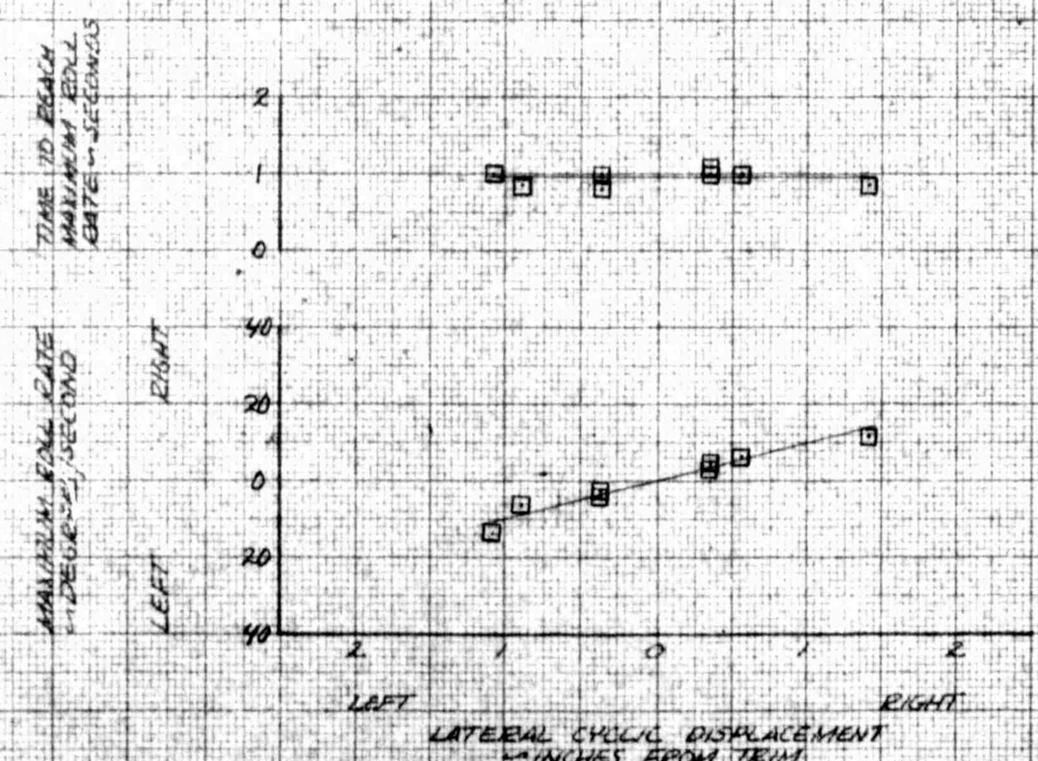


FOR OFFICIAL USE ONLY

LATERAL CONTROL RESPONSE
OH-4A USA S/N 62-4204
SAE OFF

SYM	AIRSPEED ~KCAS	AVG Hp ~FT	AVG GW ~LB	AVG C.G. ~IN LONG	AVG C.G. ~IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	760	2605	104.70	1.25LT	394	XM-7	HOVER (IGE)
□	35 KTS	4945	2560	104.50	1.25LT	394	XM-7	LEVEL FLIGHT
△	92 KTS	5010	2580	104.60 (9FT)	1.25LT	394	XM-7	LEVEL FLIGHT

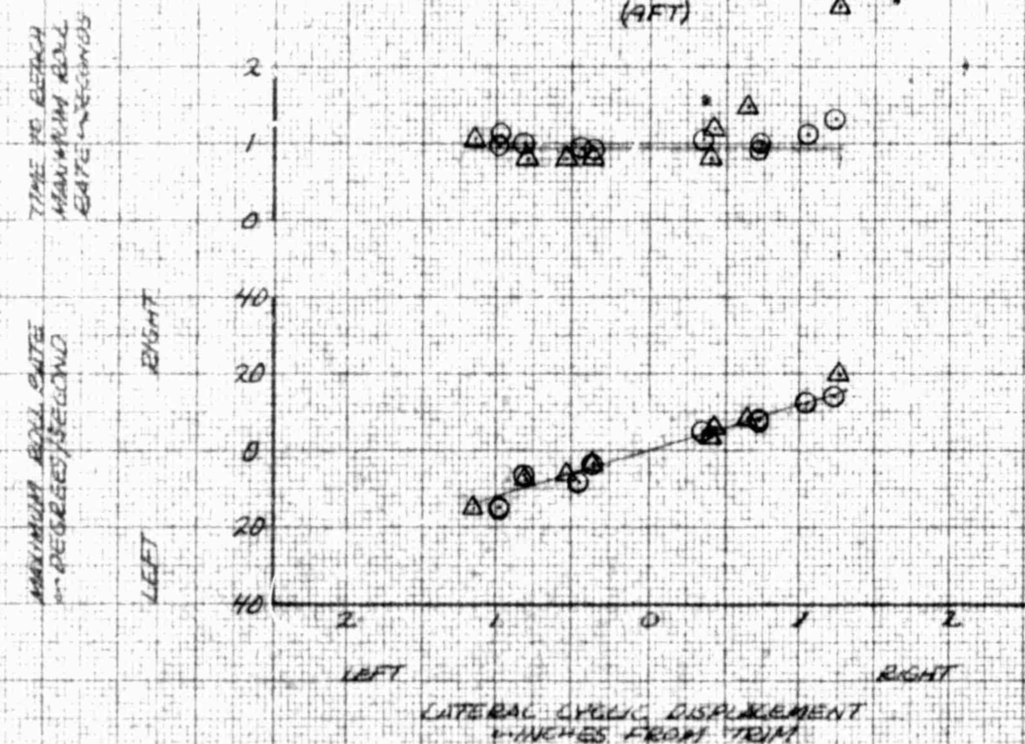


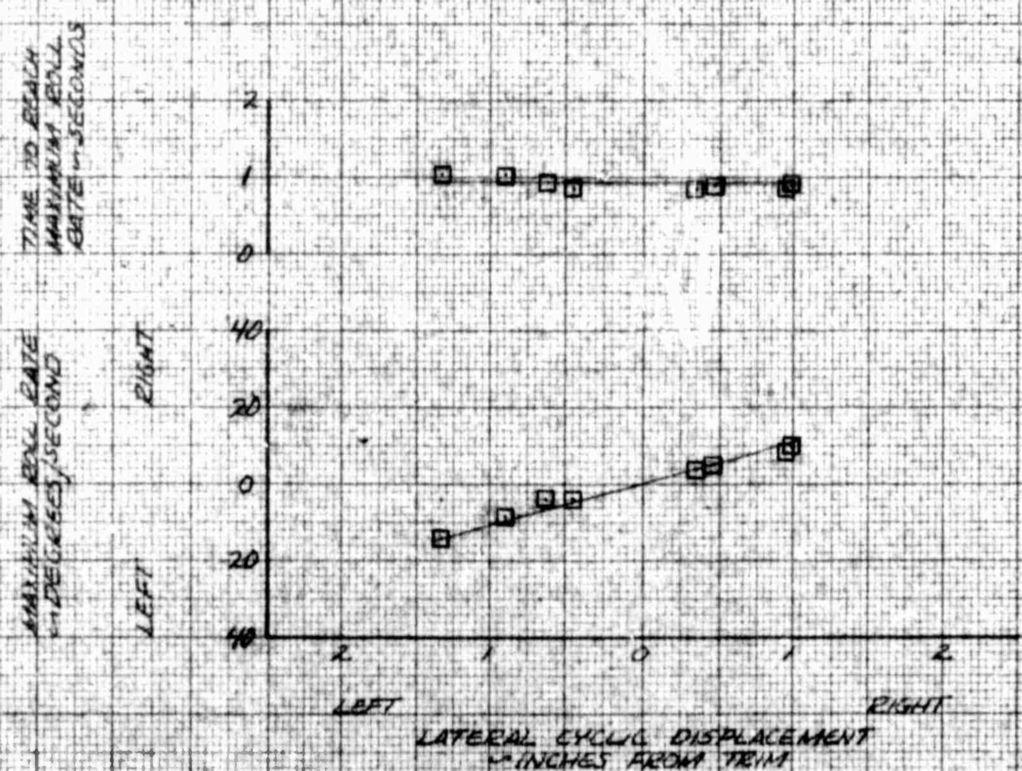


FOR OFFICIAL USE ONLY

LATERAL CONTROL RESPONSE
OH-4A USA S/N 62-4204
SAE ON

SYM	AIRSPEED ~ CAS	AVG H_D ~ FT	AVG G.W. ~ LB	AVG C.G. ~ IN LONG	AVG C.G. ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
⊙	ZERO	760	2535	104.45	1.25 LT	394	XM-7	HOVER (IGE)
□	35 KTS	4670	2545	104.50	1.25 LT	394	XM-7	LEVEL FLIGHT
△	92 KTS	4765	2605	104.70 (AFT)	1.25 LT	394	XM-7	LEVEL FLIGHT





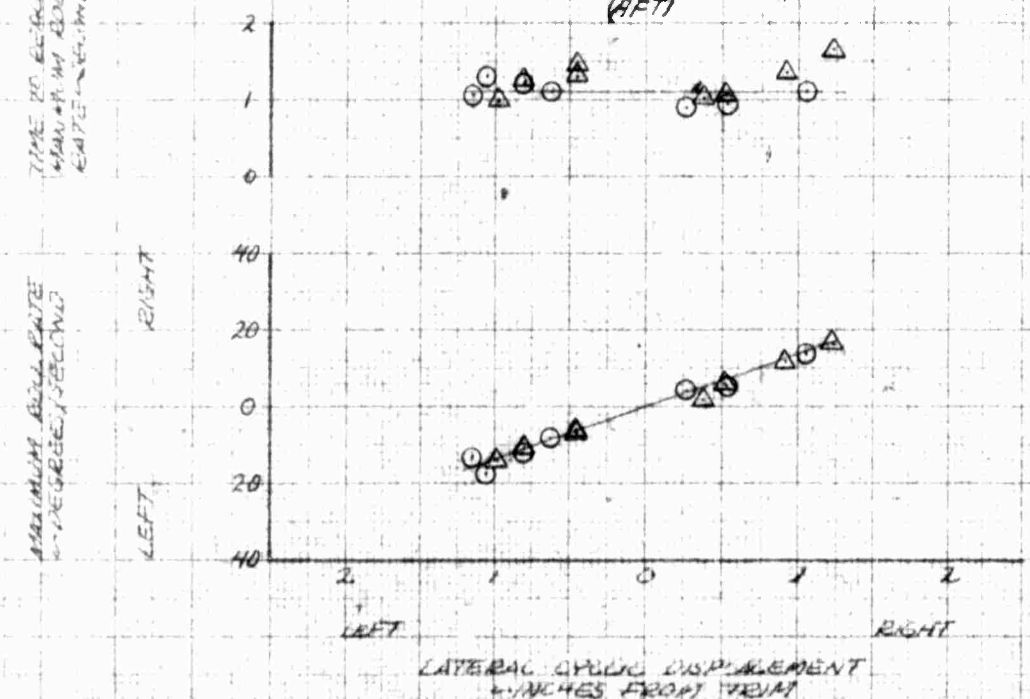
FOR OFFICIAL USE ONLY

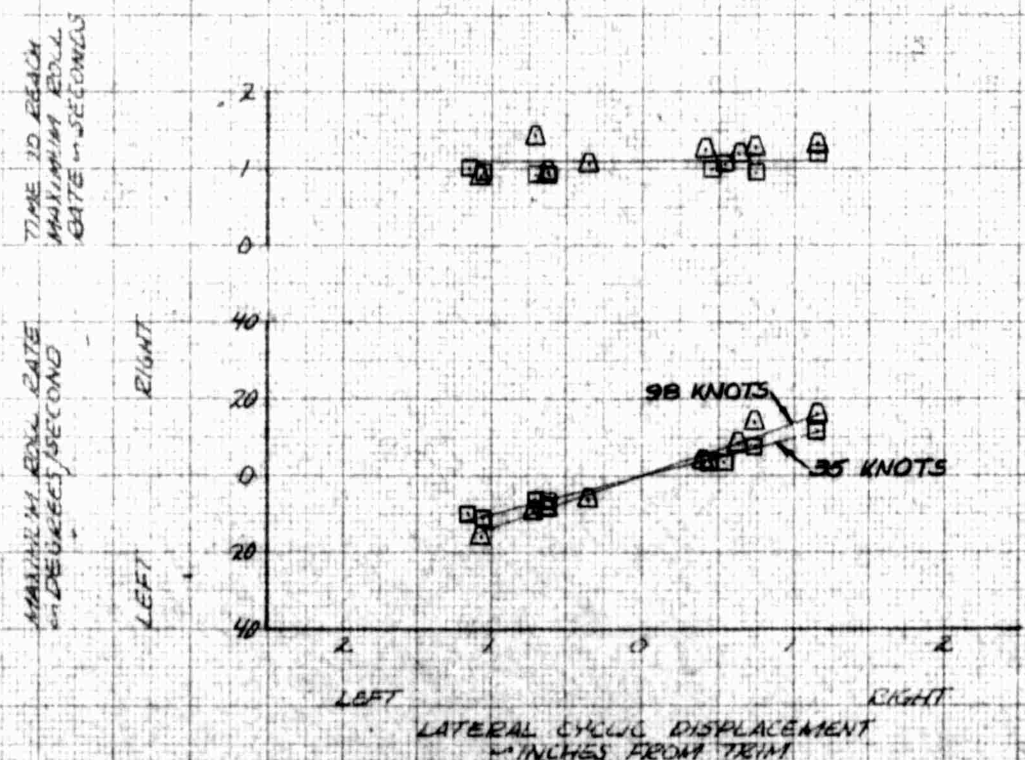
LATERAL CONTROL RESPONSE

OH-4A USA S/N 62-4204

SAE OFF

SYM	AIRSPEED ~CAS	AVG Hp ~FT	AVG GW ~LB	AVG C.G. LONG	C.G. LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	630	2650	105.40	1.30LT	394	XM-8	HOVER (IGE)
□	35 KTS	5015	2555	105.05	1.30LT	394	XM-8	LEVEL FLIGHT
△	92 KTS	4770	2530	105.00	1.30LT	394	XM-8	LEVEL FLIGHT
△	98 KTS	5030	2505	104.95 (AFT)	1.30LT	394	XM-8	LEVEL FLIGHT



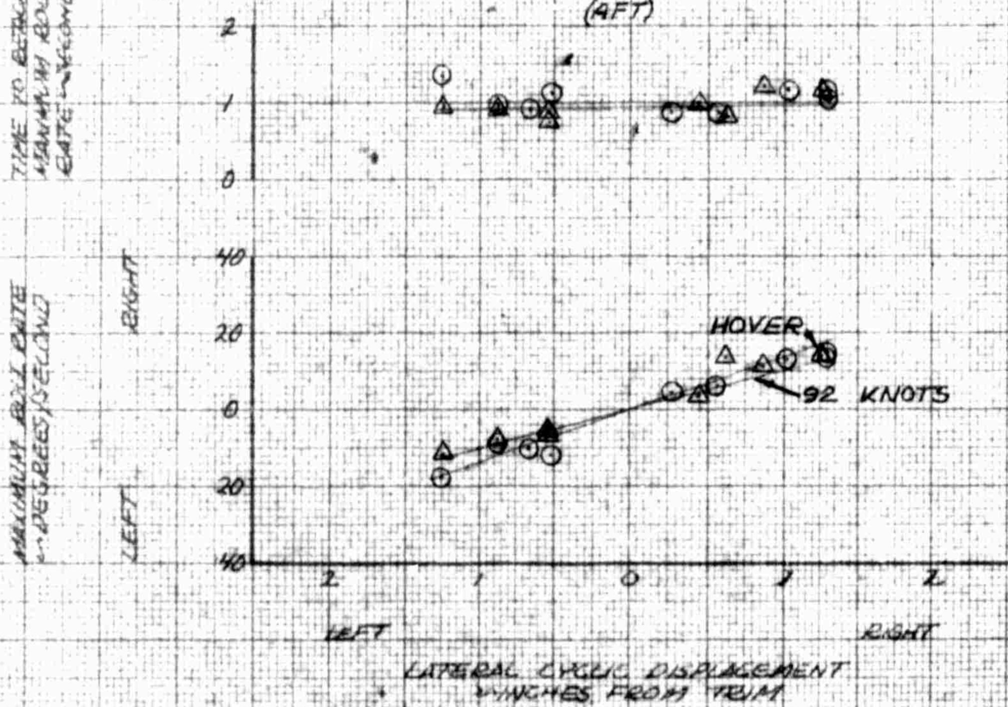


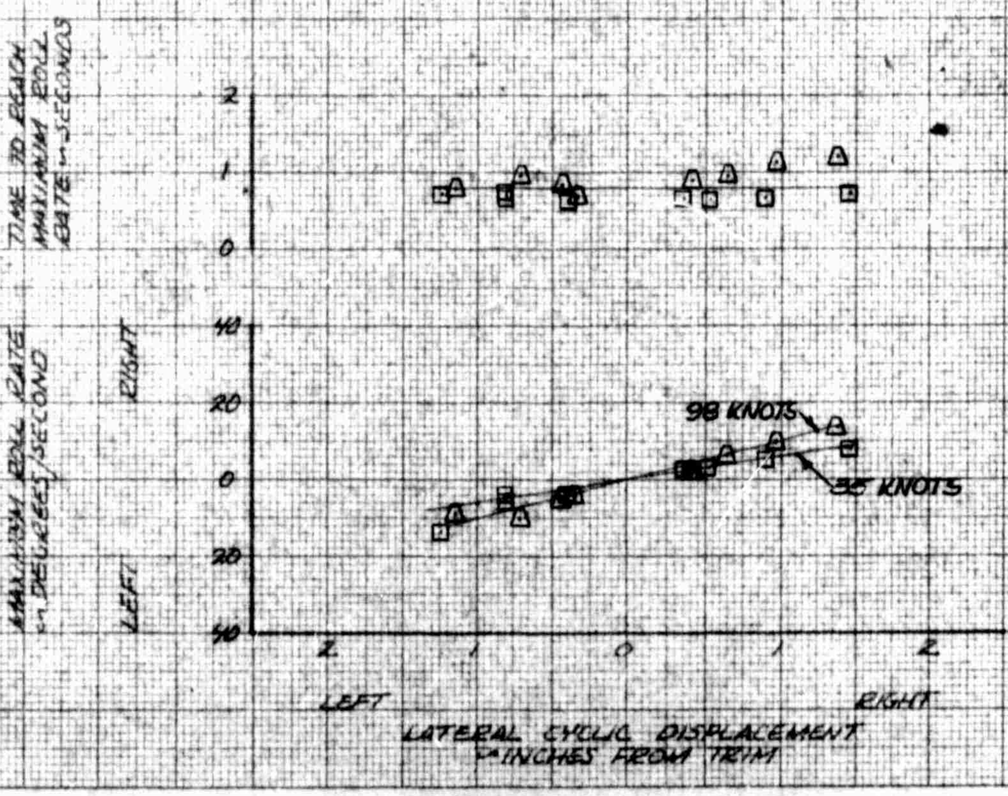
FOR OFFICAL USE ONLY

OH-4A USA S/N 62-4204

SAE ON

SYM	AIRSPEED ~ CAS	AVG H_p ~FT	AVG G.W. ~LB	AVG C.G. ~ IN LONG	AVG C.G. ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT. COND
○	ZERO	300	2610	105.25	1.30 LT	394	XM-8	HOVER (IGE)
□	35 KTS	4490	2560	104.75	1.30 LT	394	XM-8	LEVEL FLIGHT
△	92 KTS	5445	2610	105.25	1.30 LT	394	XM-8	LEVEL FLIGHT
△	98 KTS	5220	2585	105.15 (AFT)	1.30 LT	394	XM-8	LEVEL FLIGHT

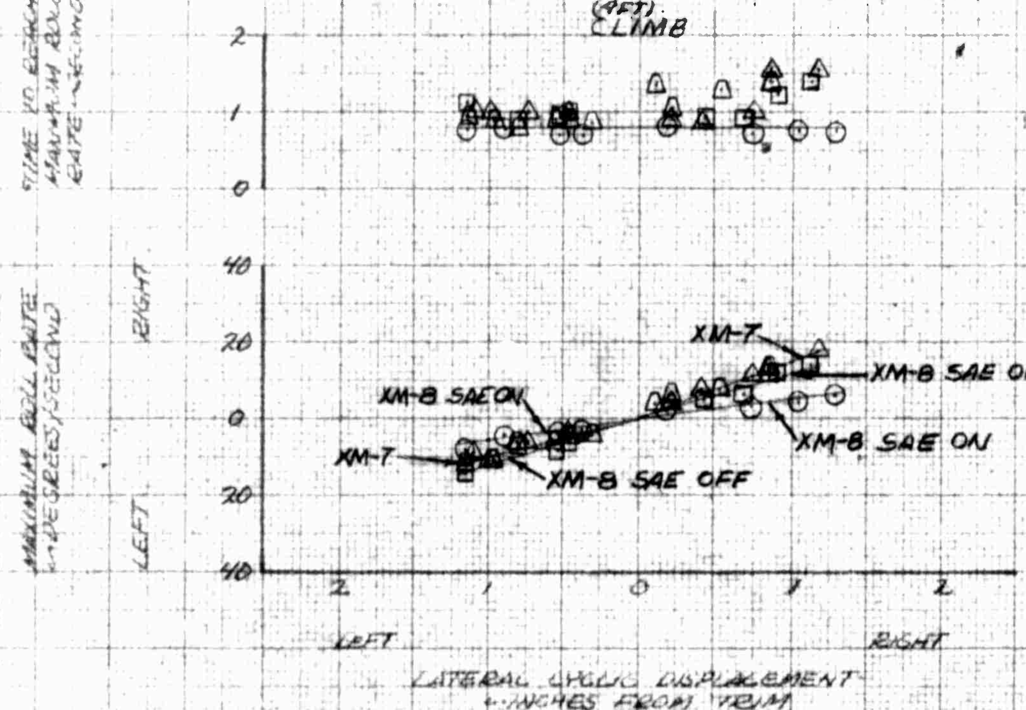


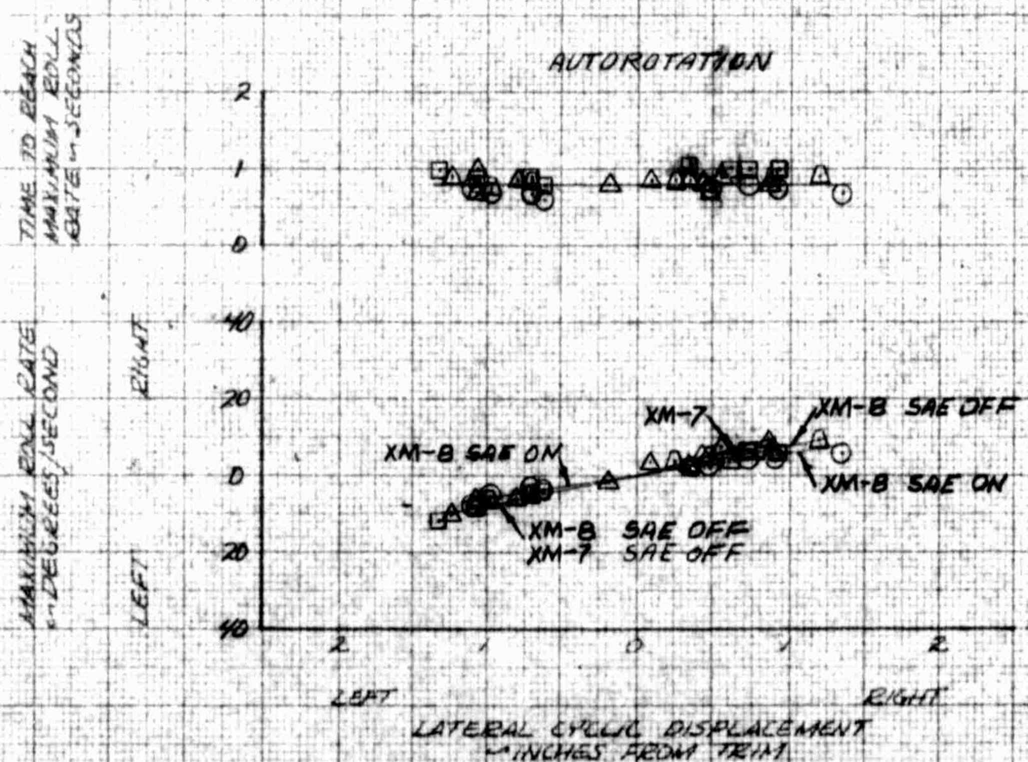


FOR OFFICAL USE ONLY

OH-4A USA S/N 62-4204

SYM	AIRSPEED ~ CAS	AVG Hp ~FT	AVG GW ~LB	AVG CG LONG	CG ~ IN LAT	ROTOR RPM	CONFIGURATION		FLT. COND
○	45 KTS	5000	2616	105.00	1.30 LT	394	XM-8	SAE ON	NOTED
□	45 KTS	5000	2600	105.20	1.30 LT	394	XM-8	SAE OFF	NOTED
△	45 KTS	5000	2638	104.70	1.25 LT	394	XM-7	SAE ON	NOTED
△	45 KTS	5000	2645	104.90 (AFT)	1.25 LT	394	XM-7	SAE OFF	NOTED





FOR OFFICAL USE ONLY

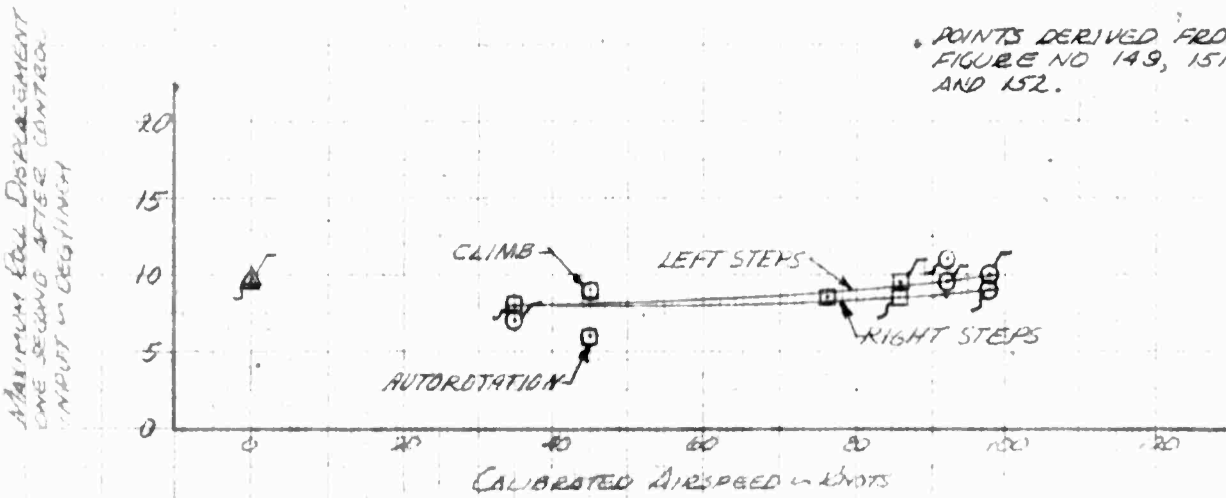
OH-4A USA S/N 62-4204

SAE OFF

SYM	AVG H_p ~ FT	AVG G.W. ~ LB	AVG CG ~ IN LONG	AVG CG ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
△	780	2590	105.50	.35 RT	394	CLEAN	HOVER (IGE)
○	5050	2565	105.40	.35 RT	394	CLEAN	LEVEL FLIGHT AND NOTED
□	9940	2530	105.20 (AFT)	.35 RT	394	CLEAN	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH LEFT AND RIGHT STEPS
SYMBOLS WITH FLAGS DENOTE LEFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE RIGHT STEPS ONLY

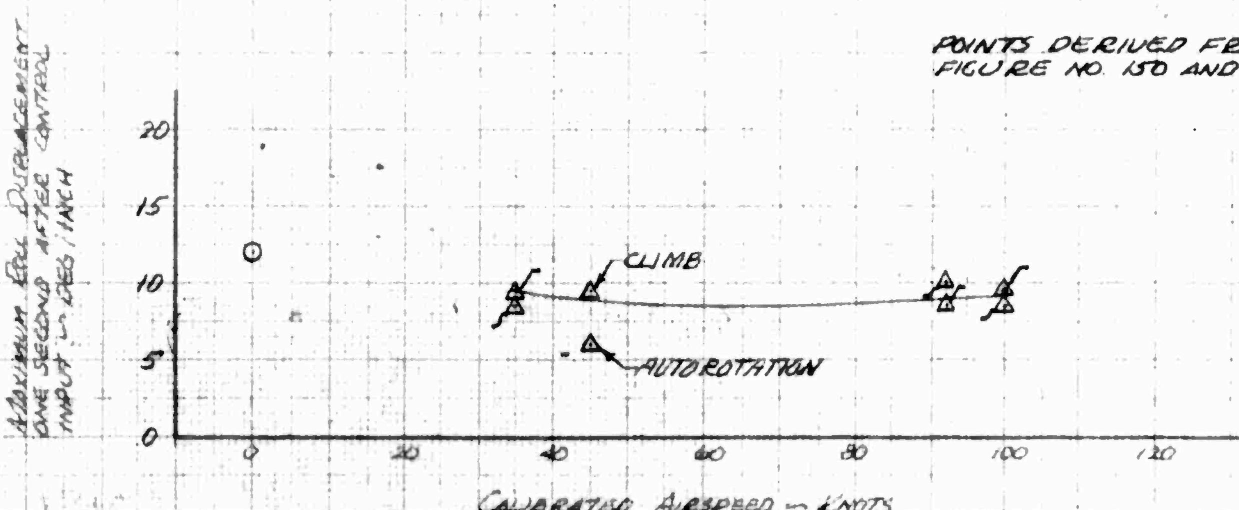
POINTS DERIVED FROM FIGURE NO 149, 151, AND 152.



SYM	AVG H_p ~ FT	AVG G.W. ~ LB	AVG CG ~ IN LONG	AVG CG ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	860	2845	104.70	.75 LT	394	CLEAN	HOVER (IGE)
△	4915	2850	104.70 (AFT)	.75 LT	394	CLEAN	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH LEFT AND RIGHT STEPS
SYMBOLS WITH FLAGS DENOTE LEFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE RIGHT STEPS ONLY

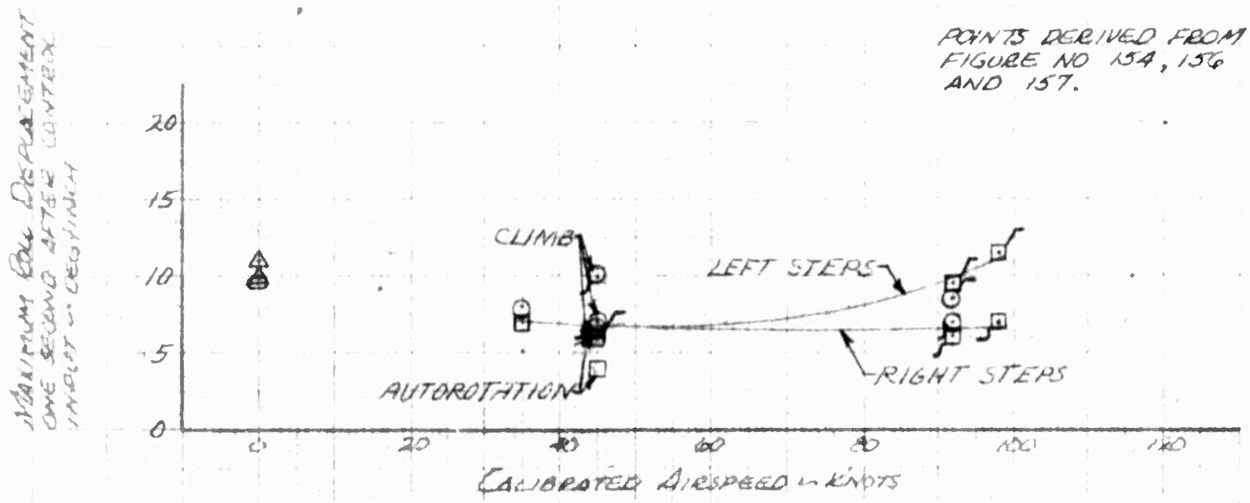
POINTS DERIVED FROM FIGURE NO. 150 AND 152



FOR OFFICAL USE ONLY

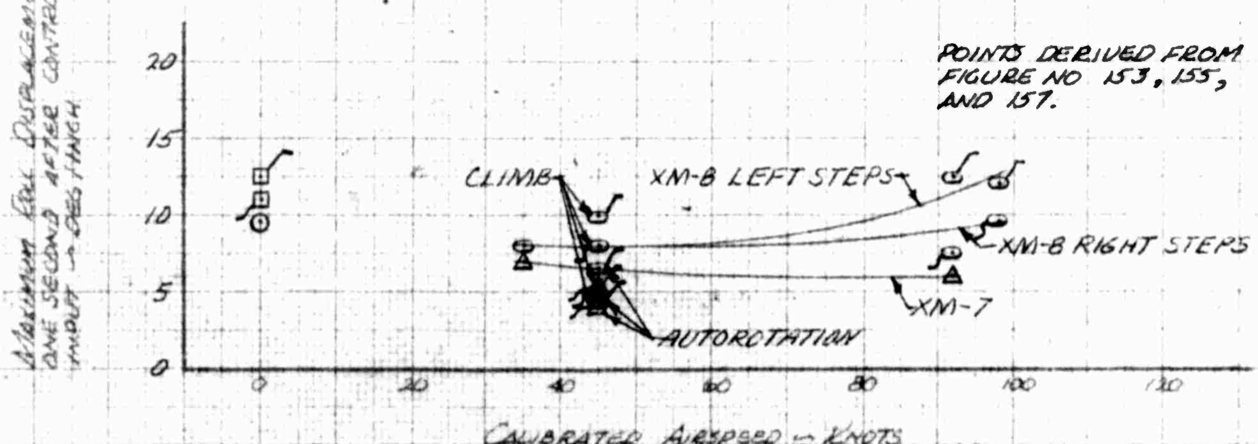
SYM	AVG H_D ~FT	AVG G.W ~LB	AVG CG ~ IN LONG	AVG CG ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
△	760	2535	104.45	1.25LT	394	XM-7 SAE ON	HOVER (IGE)
⬭	300	2610	105.25	1.30LT	394	XM-8 SAE ON	HOVER (IGE)
○	4860	2595	104.70	1.25LT	394	XM-7 SAE ON	LEVEL FLIGHT AND NOTED
□	5030	2595	105.20 (AFT)	1.30LT	394	XM-8 SAE ON	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH LEFT AND RIGHT STEPS
SYMBOLS WITH FLAGS DENOTE LEFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE RIGHT STEPS ONLY



SYM	AVG H_D ~FT	AVG G.W ~LB	AVG CG ~ IN LONG	AVG CG ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	760	2605	104.70	1.25LT	394	XM-7 SAE OFF	HOVER (IGE)
□	630	2650	105.40	1.30LT	394	XM-8 SAE OFF	HOVER (IGE)
△	4990	2590	104.60	1.25LT	394	XM-7 SAE OFF	LEVEL FLIGHT AND NOTED
⬭	4965	2560	105.10 (AFT)	1.30LT	394	XM-8 SAE OFF	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH LEFT AND RIGHT STEPS
SYMBOLS WITH FLAGS DENOTE LEFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE RIGHT STEPS ONLY



SAE OFF

SYM	AIRSPEED ~KCAS	AVG H_p ~FT	AVG GW ~LB	AVG CG ~IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	780	2590	105.50	.35RT	394	CLEAN	HOVER (IGE)
□	35 KTS	5255	2535	105.40	.35RT	394	CLEAN	LEVEL FLIGHT
△	92 KTS	5315	2505	105.20	.35RT	394	CLEAN	LEVEL FLIGHT
⏢	100.5 KTS	4670	2600	105.60 (AFT)	.35RT	394	CLEAN	LEVEL FLIGHT

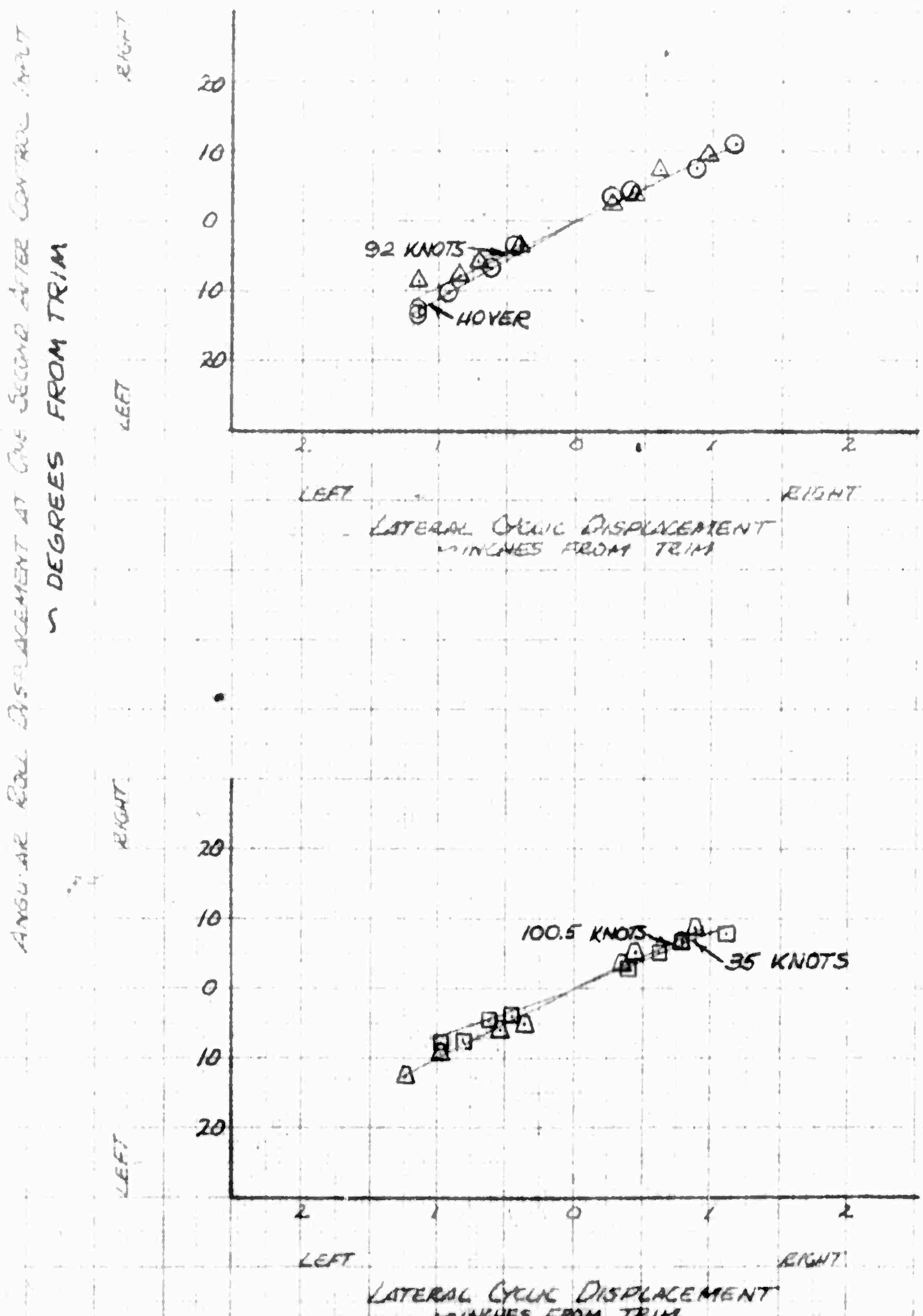


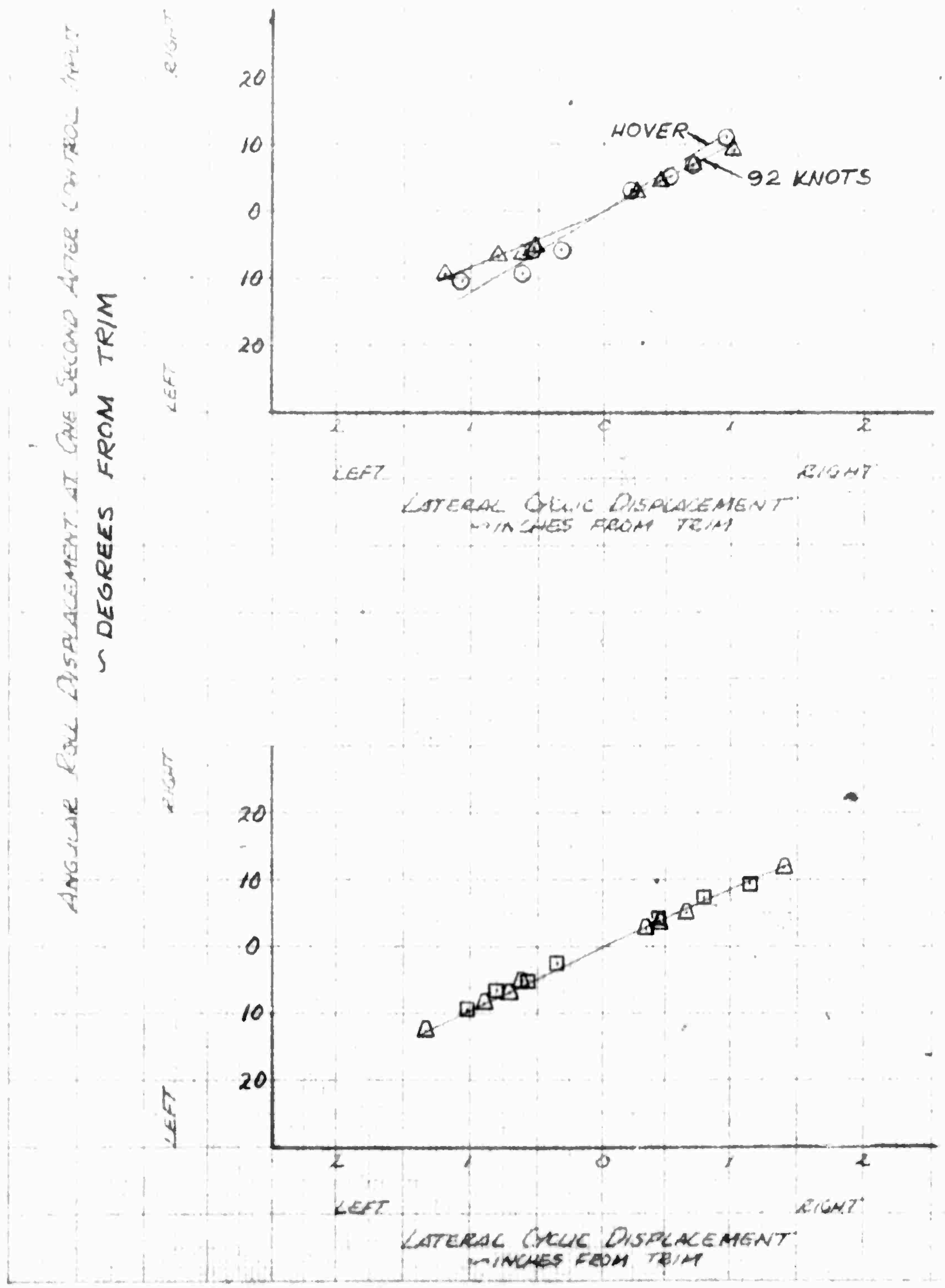
FIGURE NO 150

ANGULAR ROLL DISPLACEMENT

OH 4A USA S/N 62 4204

SAE OFF

SYM	AIRSPEED KCAS	AVG Hp FT	AVG GW LB	AVG CG LONG	AVG CG LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	860	2845	104.70	.75 LT	394	CLEAN	HOVER (IGE)
□	35 KTS	4715	2825	104.70	.75 LT	394	CLEAN	LEVEL FLIGHT
△	92 KTS	5030	2790	104.55	.75 LT	394	CLEAN	LEVEL FLIGHT
△	100 KTS	4820	2860	104.80 (AFT)	.75 LT	394	CLEAN	LEVEL FLIGHT



FOR OFFICIAL USE ONLY

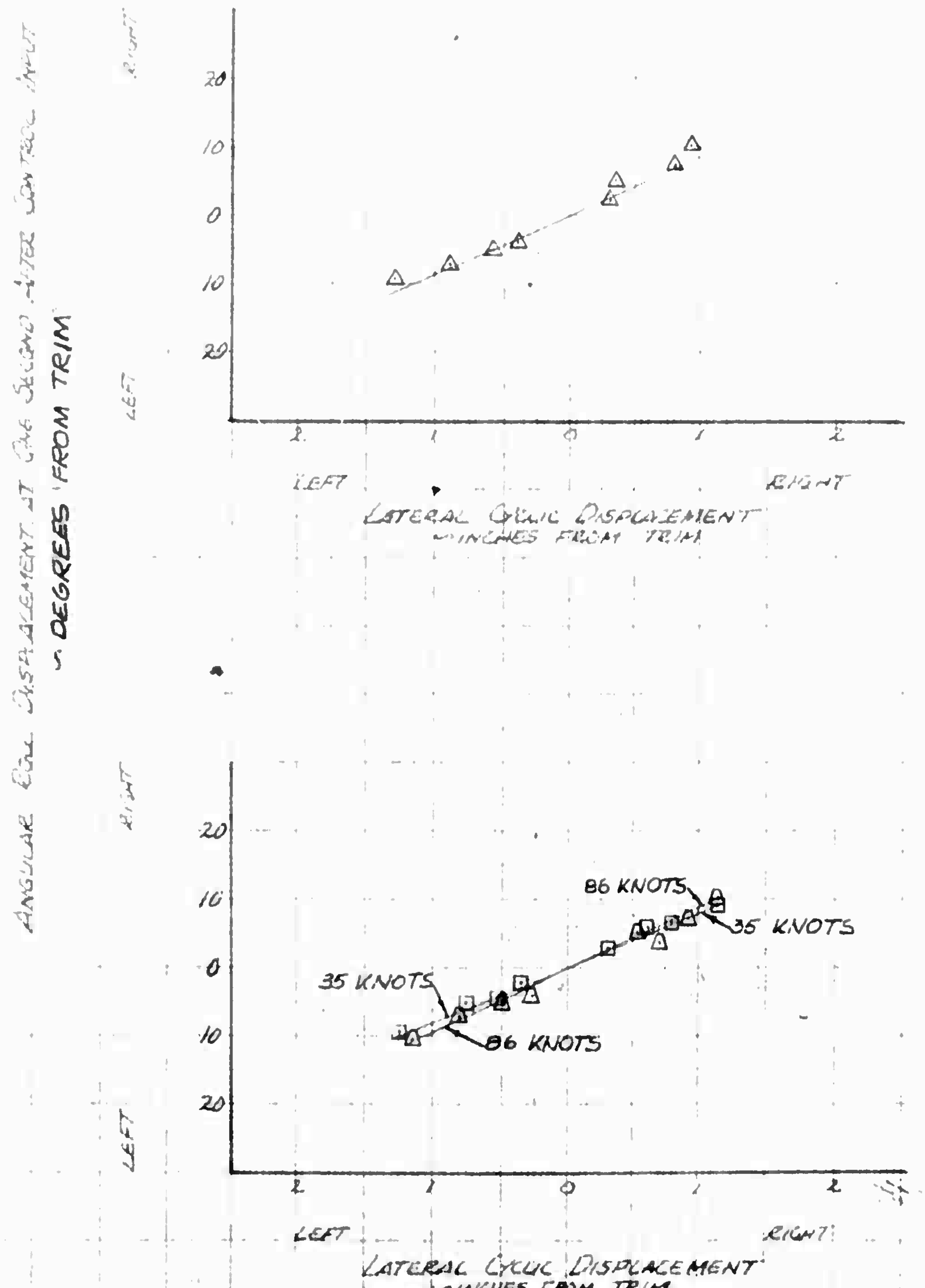
FIGURE NO 151

ANGULAR ROLL DISPLACEMENT

OH 4A USA S/N 62 4202

SHE OFF

SYM	AIRSPEED KCAS	AVG Hp FT	AVG GW LB	AVG CG LONG	AVG CG LAT	ROTOR RPM	CONFIGURATION	FLIGHT CONDITION
□	35 KTS	9995	2525	105.30	.35RT	394	CLEAN	LEVEL FLIGHT
△	76 KTS	9840	2505	105.20	.35RT	394	CLEAN	LEVEL FLIGHT
⊔	86 KTS	9870	2475	105.10 (AFT)	.35RT	394	CLEAN	LEVEL FLIGHT

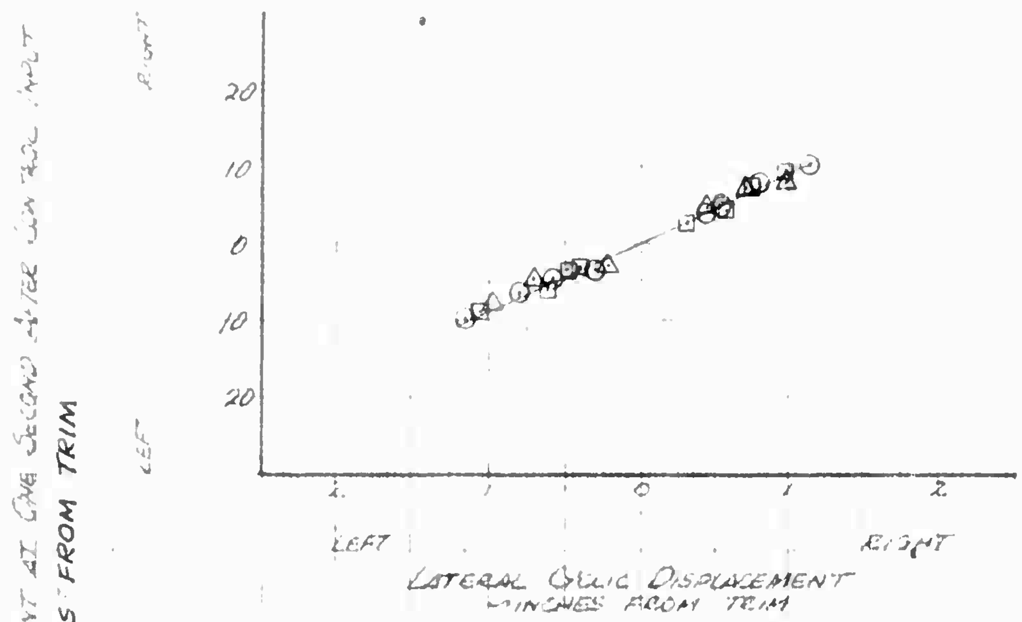


FOR OFFICIAL USE ONLY

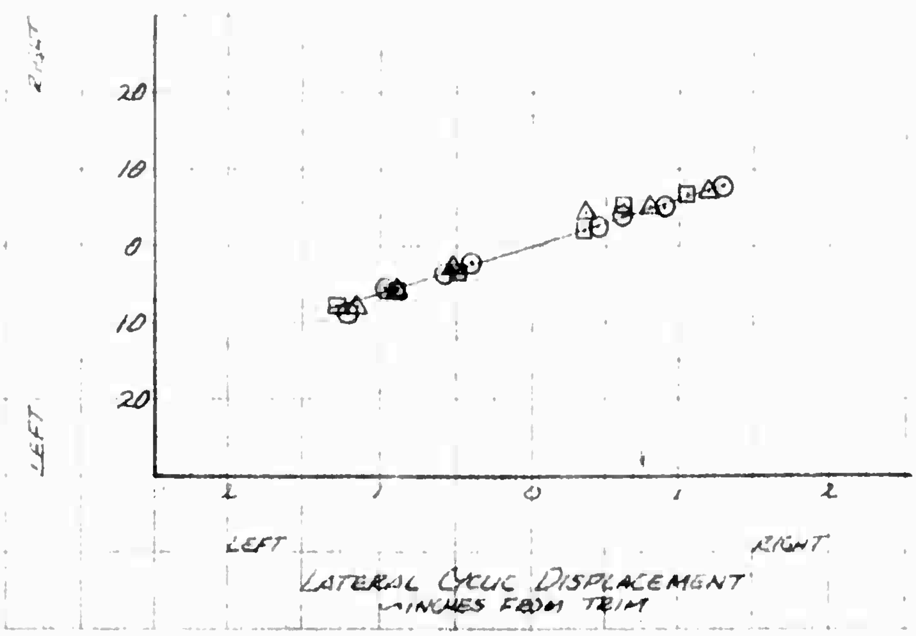
FIGURE NO 152
ANGULAR ROLL DISPLACEMENT
OH 4A USA S/N 62-4201
SHE OFF

SYM	AIRSPEED KCAS	AVG Hp FT	AVG GW LB	AVG CG LONG	AVG CG LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	45 KTS	5000	2600	105.70	.35 RT	394	CLEAN	NOTED
□	45 KTS	10000	2575	105.60	.35 RT	394	CLEAN	NOTED
△	45 KTS	5000	2895	105.05 (AFT)	.75 LT	394	CLEAN	NOTED

CLIMB



AUTOROTATION



FOR OFFICAL USE ONLY

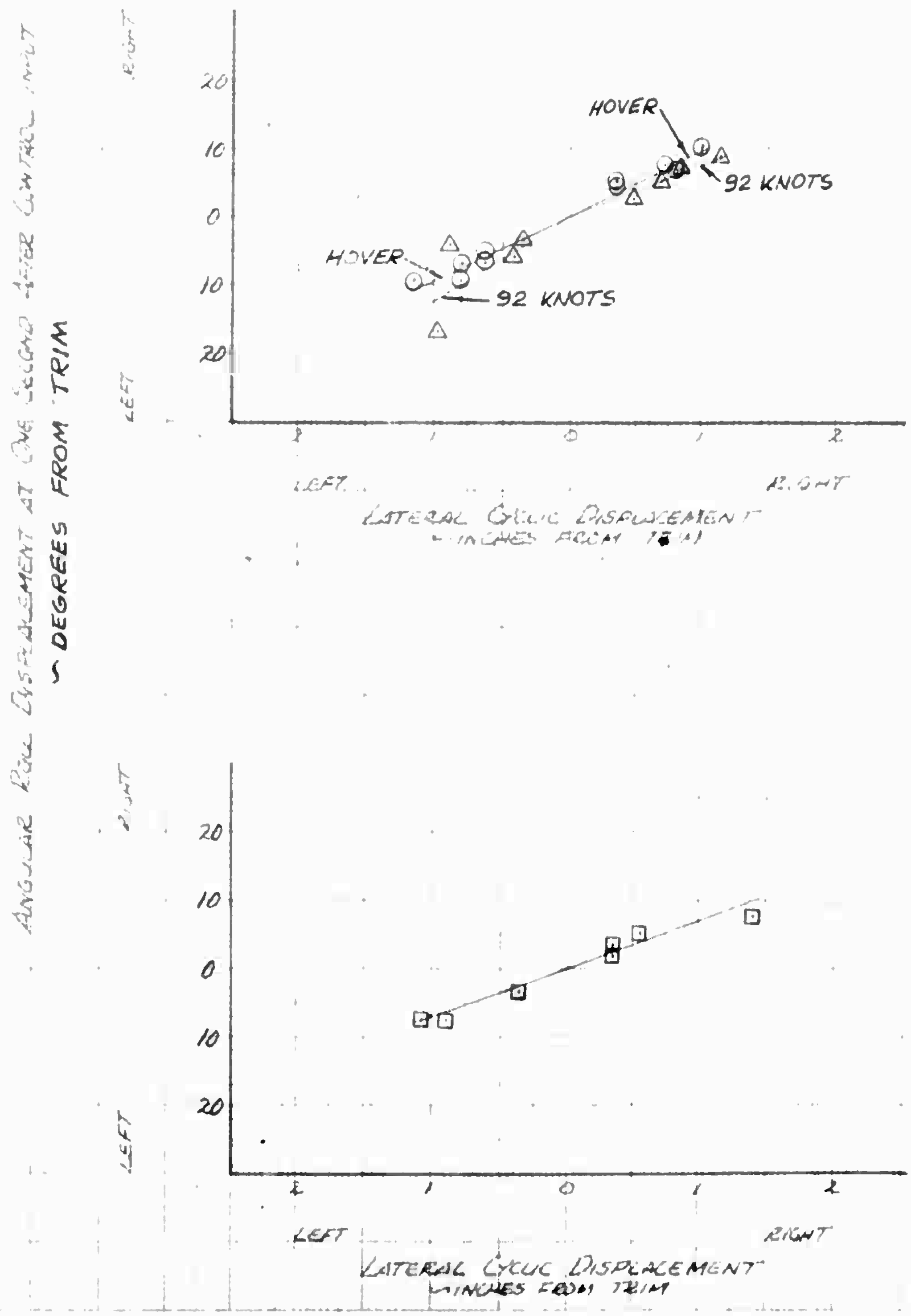
FIGURE NO 153

ANGULAR ROLL DISPLACEMENT

CH 4A USA S/N 62 4204

SAE OFF

SYM	AIRSPEED KCAS	AVG Hp FT	AVG GW LB	AVG CG IN LONG	LAT	ROTOR RPM	CONFIGURATION	[illegible]
○	ZERO	760	2605	104.70	1.25LT	394	XM-7	HOVER (IGE)
□	35 KTS	4945	2560	104.50	1.25LT	394	XM-7	LEVEL FLIGHT
△	92 KTS	5010	2580	104.63 (5FT)	1.25LT	394	XM-7	LEVEL FLIGHT



FOR OFFICAL USE ONLY

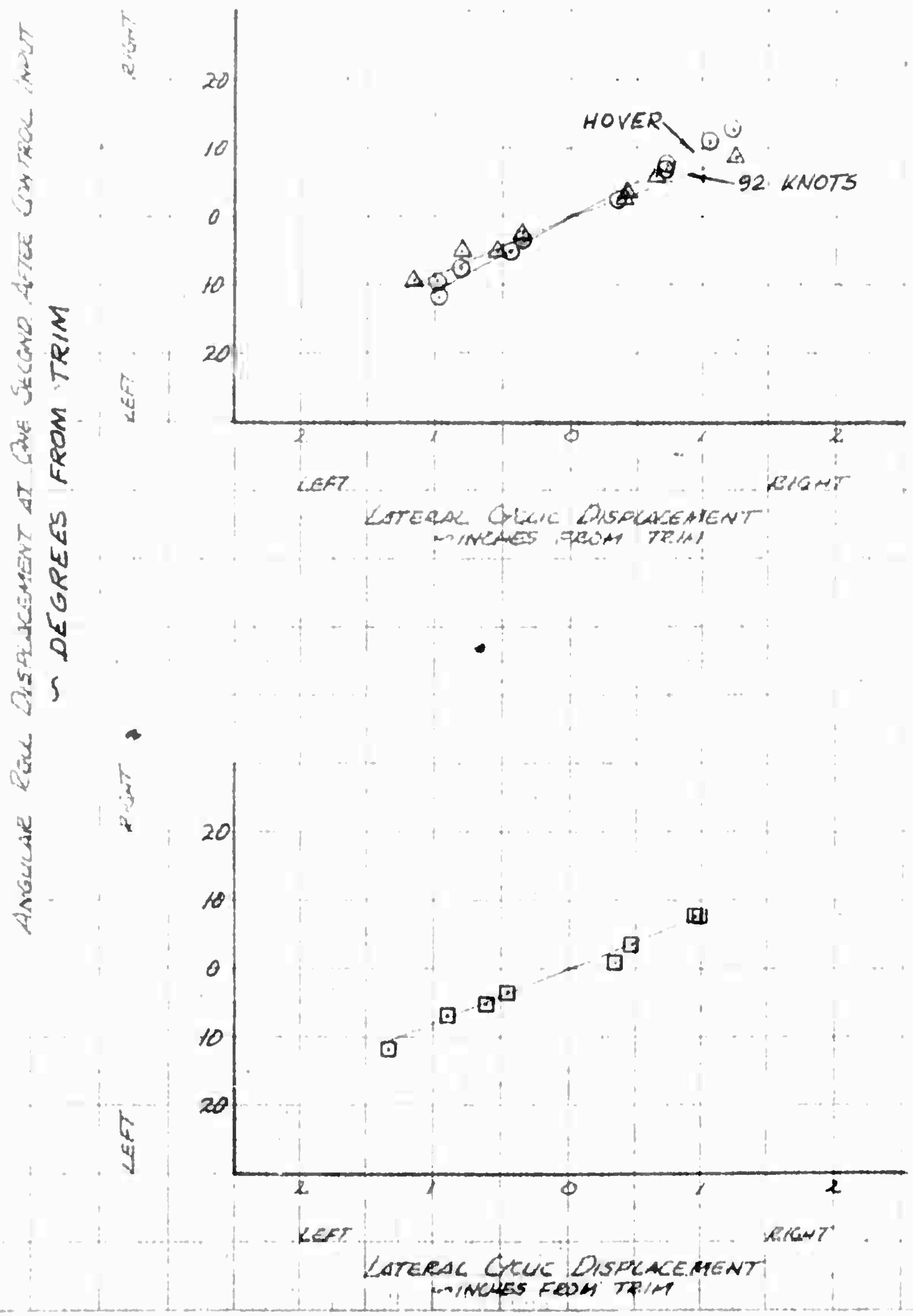
FIGURE NO 154

ANGULAR ROLL DISPLACEMENT

OH 4A USA S/N 62 4204

SAE ON

SYM	AIRSPEED KCAS	AVG H_p FT	AVG GW LB	AVG CG IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	760	2535	104.45	1.25 LT	394	XM-7	HOVER (IGE)
□	35 KTS	4670	2545	104.50	1.25 LT	394	XM-7	LEVEL FLIGHT
△	92 KTS	4765	2605	104.70 (AFT)	1.25 LT	394	XM-7	LEVEL FLIGHT



FOR OFFICIAL USE ONLY

FIGURE NO 155
ANGULAR ROLL DISPLACEMENT
OH-4A USA S/N 62 4204
SAE OFF

SYM	AIRSPEED KCAS	AVG H_p FT	AVG GW LB	AVG CG LONG	AVG CG LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	630	2650	105.40	1.30LT	394	XM-8	HOVER (IGE)
□	35 KTS	5015	2555	105.05	1.30LT	394	XM-8	LEVEL FLIGHT
△	92 KTS	4770	2530	105.00	1.30LT	394	XM-8	LEVEL FLIGHT
△	98 KTS	5030	2505	104.95 (AFT)	1.30LT	394	XM-8	LEVEL FLIGHT

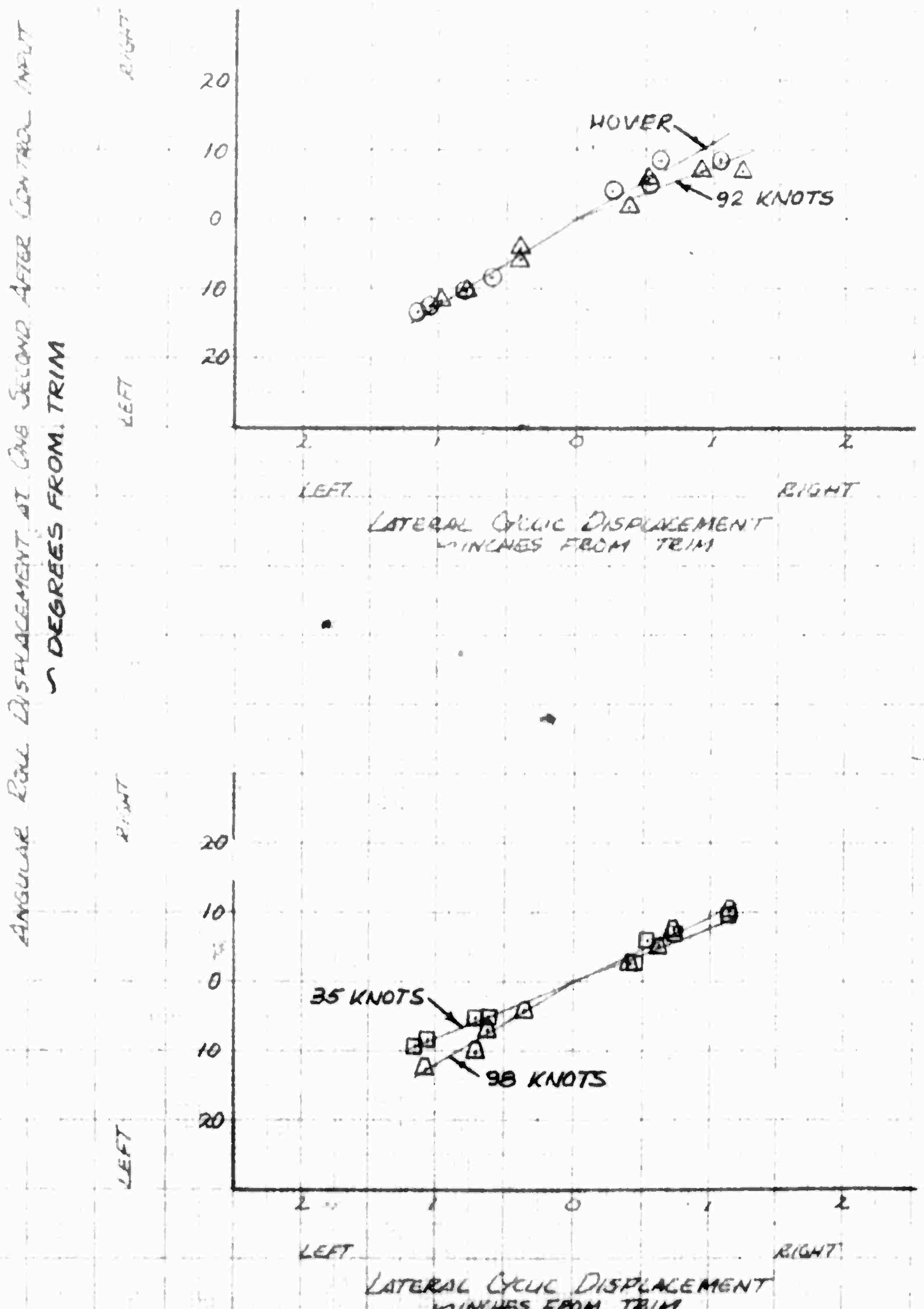
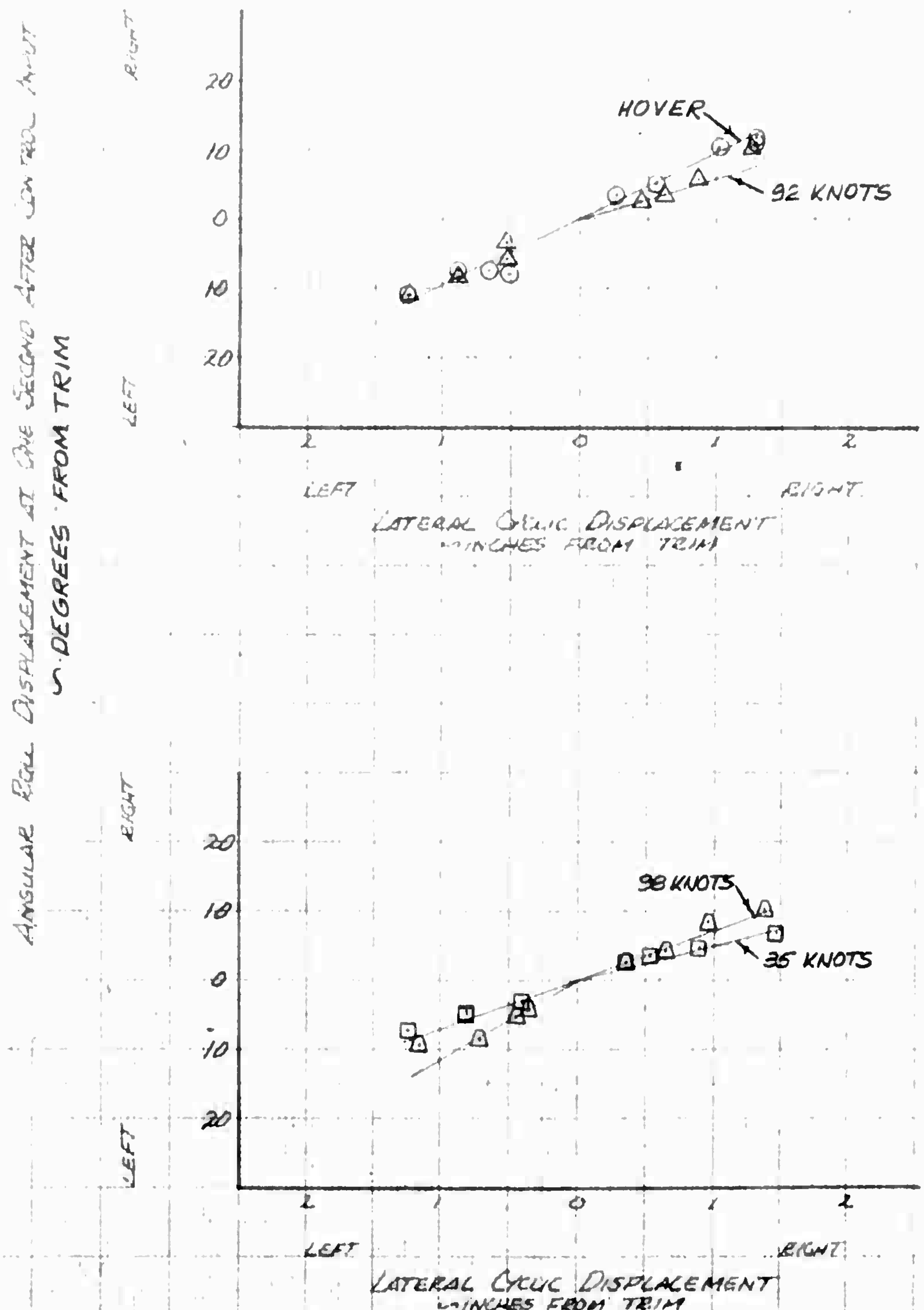


FIGURE NO 156
ANGULAR ROLL DISPLACEMENT
OH 4A USA S/N 62-4204
SAE ON

SYM	AIRSPEED KNOTS	AVG Hp FT	AVG GW LB	AVG CG INS	CG LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	300	2610	105.25	1.30LT	394	XM-8	HOVER (IGE)
□	35 KTS	4490	2560	104.75	1.30LT	394	XM-8	LEVEL FLIGHT
△	92 KTS	5445	2610	105.25	1.30LT	394	XM-8	LEVEL FLIGHT
△	98 KTS	5220	2585	105.15 (AFT)	1.30LT	394	XM-8	LEVEL FLIGHT

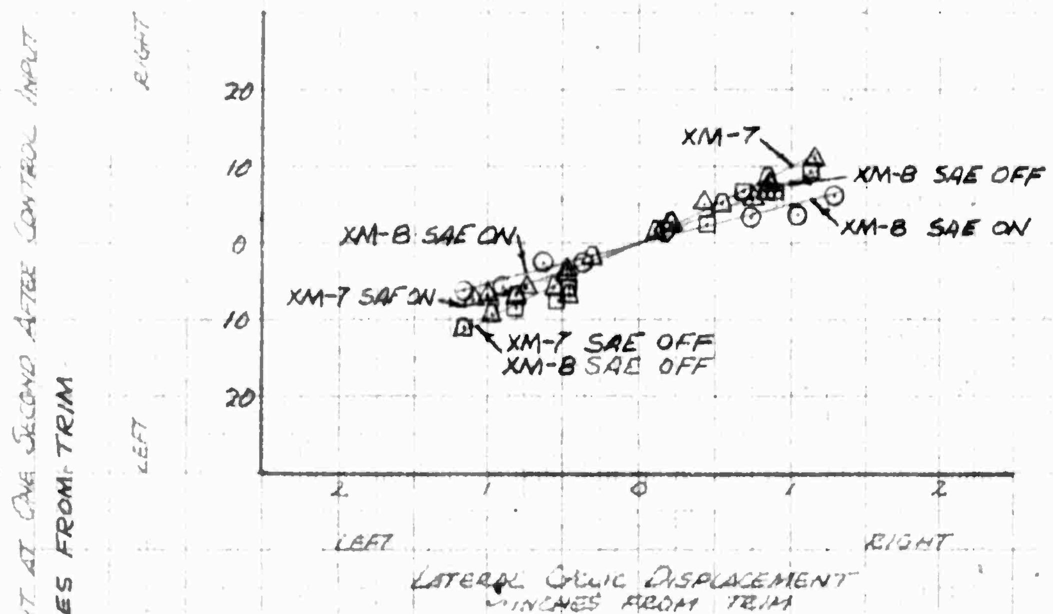


FOR OFFICAL USE ONLY

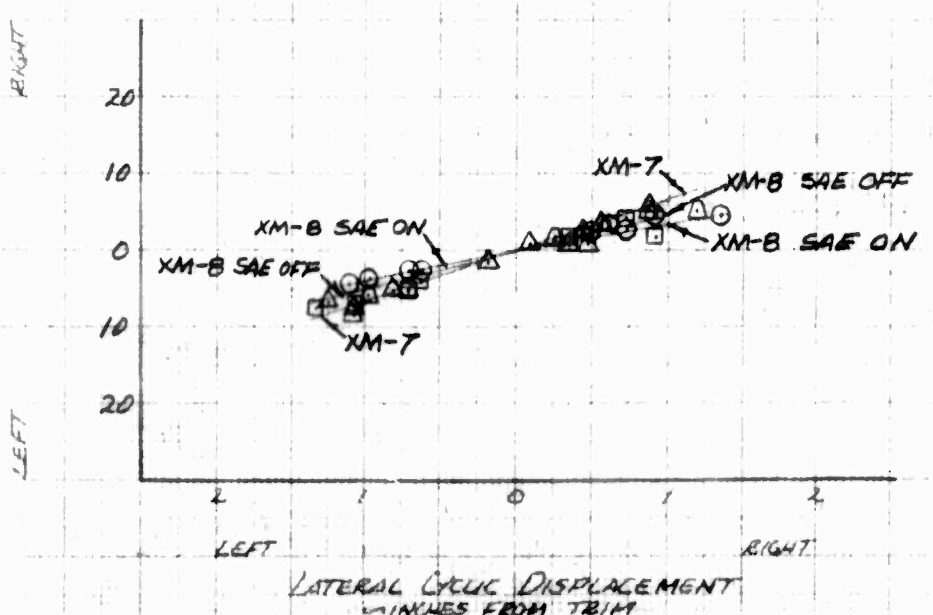
FIGURE NO 157
ANGULAR ROLL DISPLACEMENT
OH-4A USA S/N 62-4204

SYM	AIRSPEED ~CAS	AVG H_P ~FT	AVG GW ~LB	AVG CG ~IN LONG	LAT	ROTOR RPM	CONFIGURATION		FLT COND
○	45KTS	5000	2615	105.00	1.30LT	394	XM-8	SAE ON	NOTED
□	45KTS	5000	2600	105.20	1.30LT	394	XM-8	SAE OFF	NOTED
△	45KTS	5000	2610	104.70	1.25LT	394	XM-7	SAE ON	NOTED
△	45KTS	5000	2645	104.90 (AFT)	1.25LT	394	XM-7	SAE OFF	NOTED

CLIMB



AUTOROTATION



FOR OFFICAL USE ONLY

FIGURE NO. 158

SUMMARY OF DIRECTIONAL CONTROL SENSITIVITY

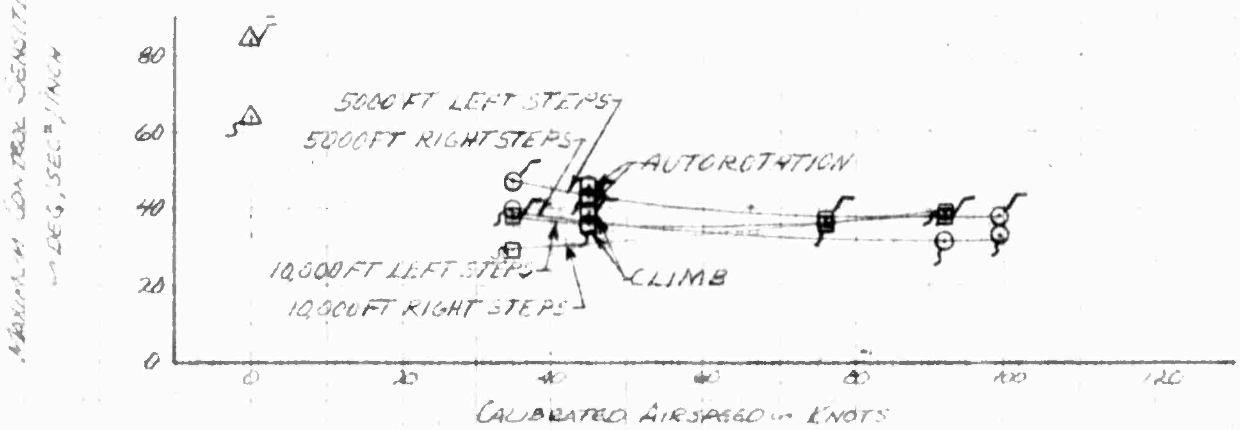
OH-4A USA S/N 62-4204

SAE OFF

SYM	AVG Hp ~FT	AVG GW ~LB	AVG CG ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
△	1070	2490	105.05	.35 RT	394	CLEAN	HOVER (IGE).
○	4800	2565	105.40	.35 RT	394	CLEAN	LEVEL FLIGHT AND NOTED
□	9690	2560	105.50 (AFT)	.35 RT	394	CLEAN	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH LEFT AND RIGHT STEPS
SYMBOLS WITH FLAGS DENOTE LEFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE RIGHT STEPS ONLY

POINTS DERIVED FROM FIGURE NO. 160, 162 AND 163.



SYM	AVG Hp ~FT	AVG GW ~LB	AVG CG ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
□	1480	2950	105.30	.75 LT	394	CLEAN	HOVER (IGE)
△	4830	2870	104.80 (AFT)	.75 LT.	394	CLEAN	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH LEFT AND RIGHT STEPS
SYMBOLS WITH FLAGS DENOTE LEFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE RIGHT STEPS ONLY

POINTS DERIVED FROM FIGURE NO 161 AND 163.

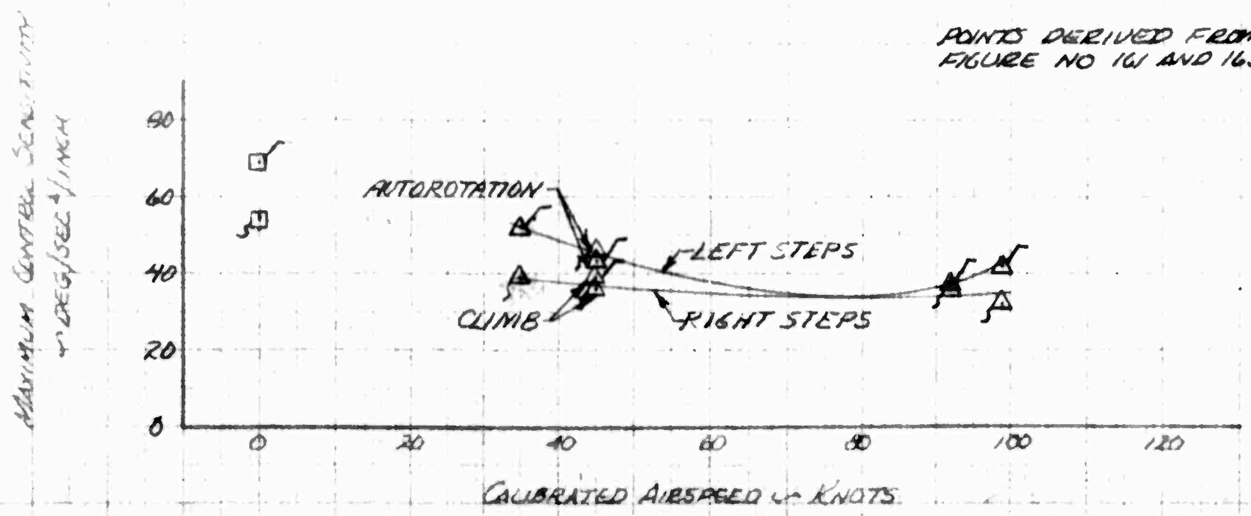
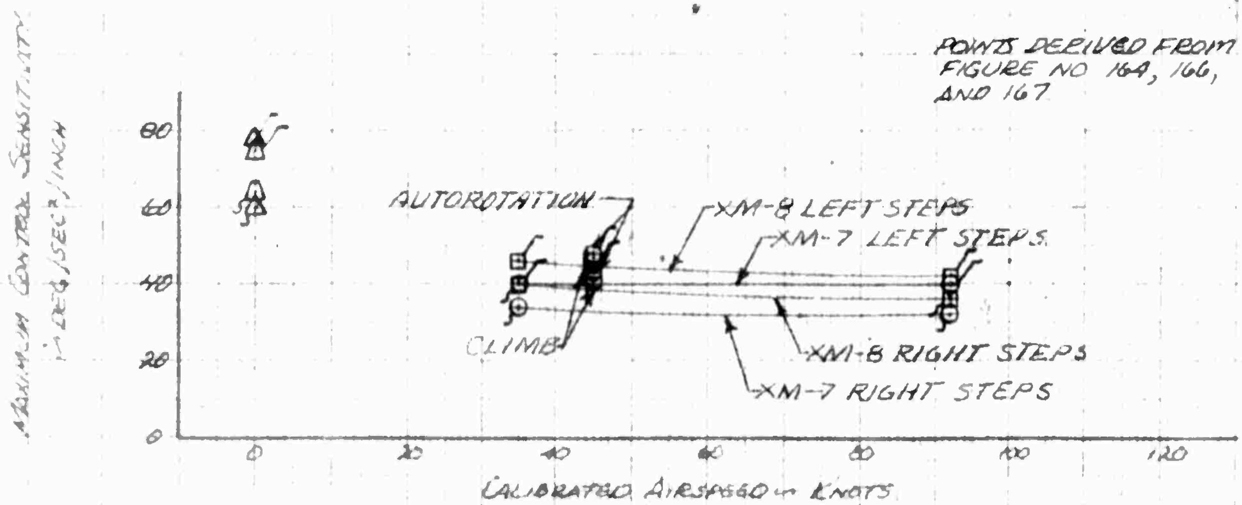


FIGURE No. 159
SUMMARY OF DIRECTIONAL CONTROL SENSITIVITY
OH-4A USA S/N 62-4204

SYM	AVG HD ~FT	AVG GW ~LB	AVG CG ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
△	2050	2660	105.00	1.25LT	394	XM-7 SAE OFF	HOVER (IGE)
△	1770	2640	105.40	1.30LT	394	XM-8 SAE OFF	HOVER (IGE)
○	4450	2600	104.70	1.25LT	394	XM-7 SAE OFF	LEVEL FLIGHT AND NOTED
□	4830	2540	105.00 (AFT)	1.30LT	394	XM-8 SAE OFF	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH LEFT AND RIGHT STEPS
SYMBOLS WITH FLAGS DENOTE LEFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE RIGHT STEPS ONLY



SYM	AVG HD ~FT	AVG GW ~LB	AVG CG ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
△	2050	2570	104.55	1.25LT	394	XM-7 SAE ON	HOVER (IGE)
○	4825	2570	104.50 (AFT)	1.25LT	394	XM-7 SAE ON	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH LEFT AND RIGHT STEPS
SYMBOLS WITH FLAGS DENOTE LEFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE RIGHT STEPS ONLY

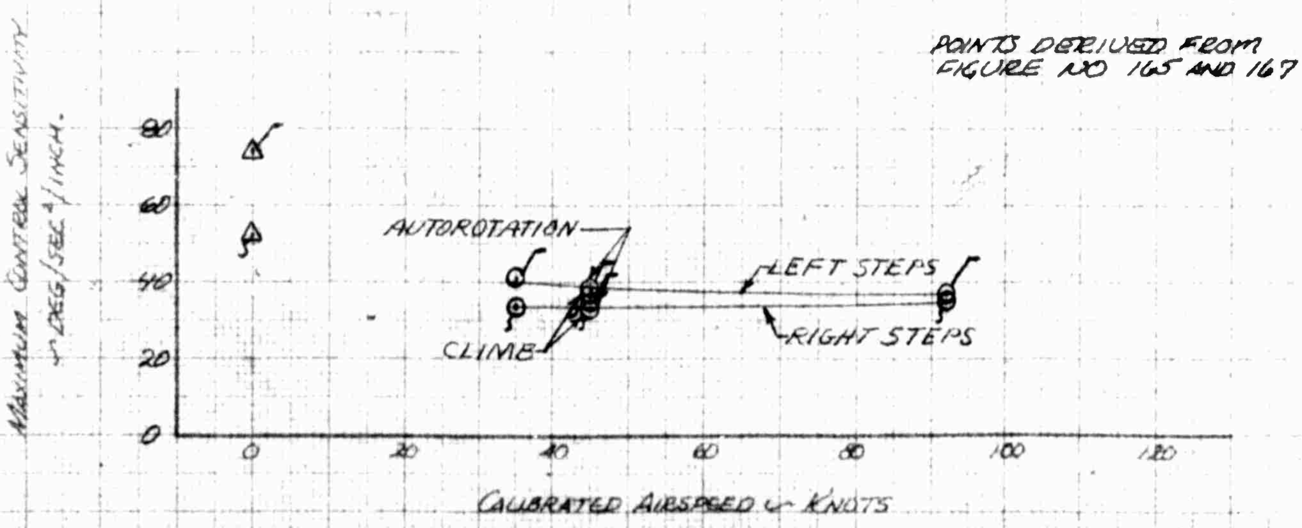


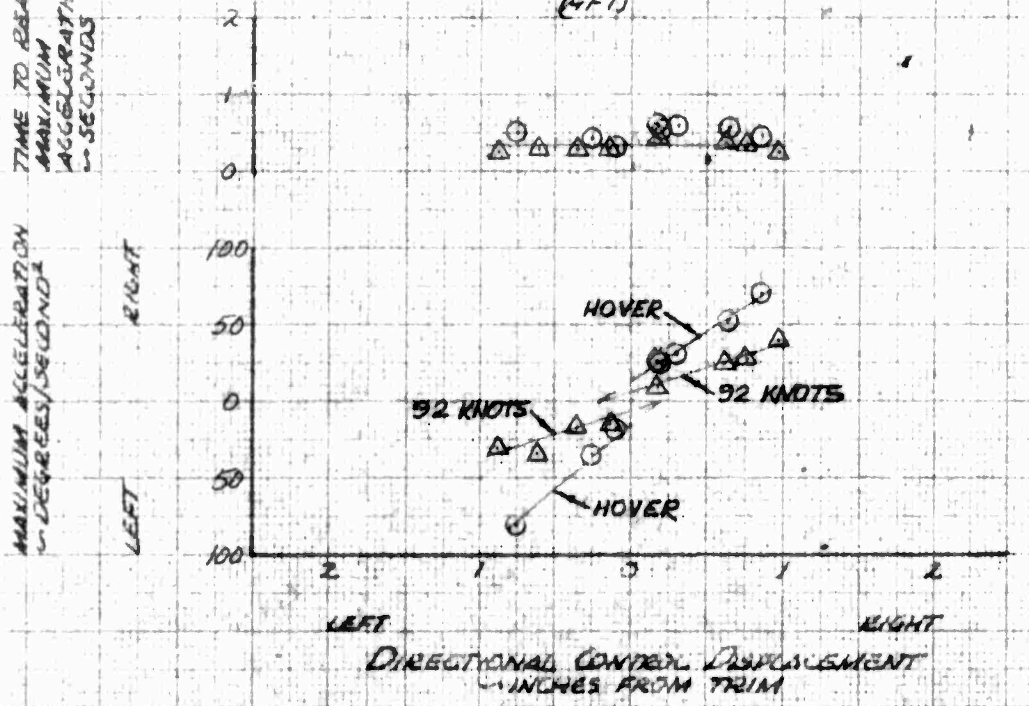
FIGURE NO. 160

DIRECTIONAL CONTROL SENSITIVITY

OH-4A USA S/N 62-4204

SAE OFF

SYM	AIRSPEED ~CAS	AVG Hp ~FT	AVG G.W. ~LB	AVG C.G ~IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT. COND.
○	ZERO	1070	2490	105.05	.35 RT	394	CLEAN	HOVER (IGE)
□	35 KTS	4525	2560	105.40	.35 RT	394	CLEAN	LEVEL FLIGHT
△	92 KTS	4840	2525	105.20	.35 RT	394	CLEAN	LEVEL FLIGHT
△	99.5 KTS	4645	2506	105.10 (AFT)	.35 RT	394	CLEAN	LEVEL FLIGHT



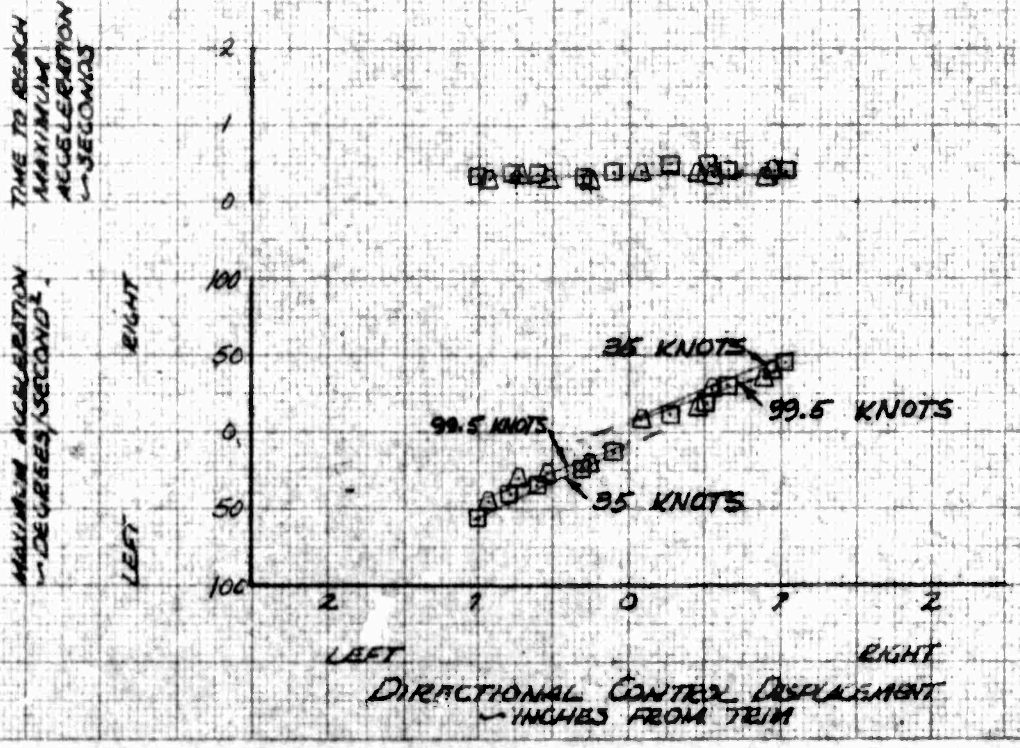
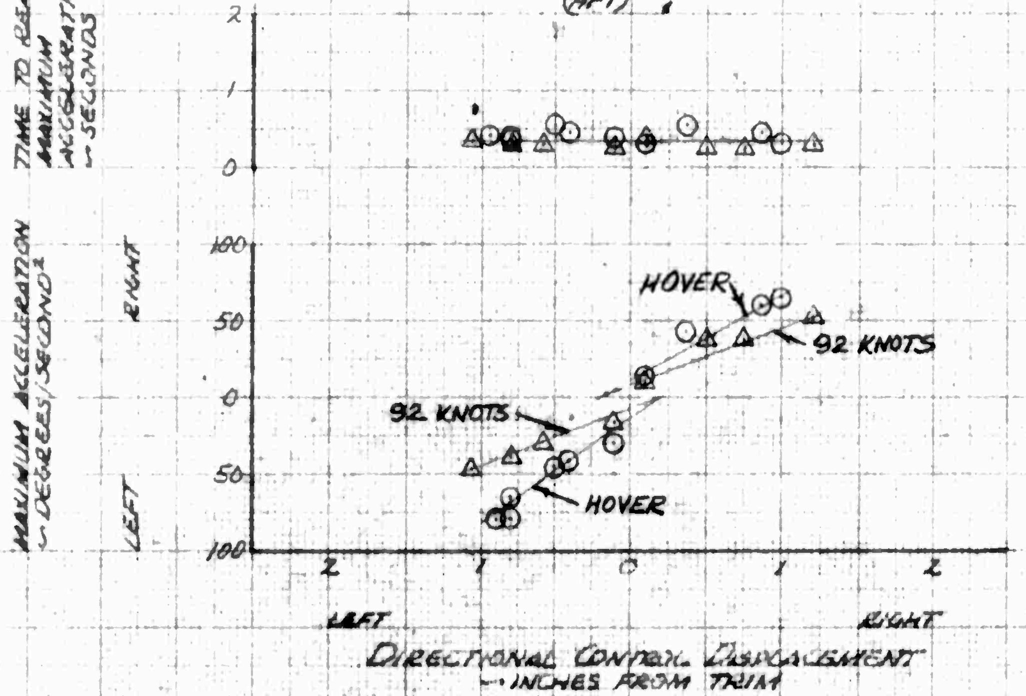


FIGURE NO. 161
DIRECTIONAL CONTROL SENSITIVITY
OH-4A USA S/N 62-4204
SAE OFF

SYM	AIRSPEED ~CAS	AVG Hp ~FT	AVG G.W. ~LB	AVG C.G. ~IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT. COND.
○	ZERO	1480	2850	105.30	.75 LT	394	CLEAN	HOVER (IGE)
□	35 KTS	4560	2870	104.80	.75 LT	394	CLEAN	LEVEL FLIGHT
△	92 KTS	4780	2845	104.70	.75 LT	394	CLEAN	LEVEL FLIGHT
△	99 KTS	4820	2825	104.60 (AFT)	.75 LT	394	CLEAN	LEVEL FLIGHT



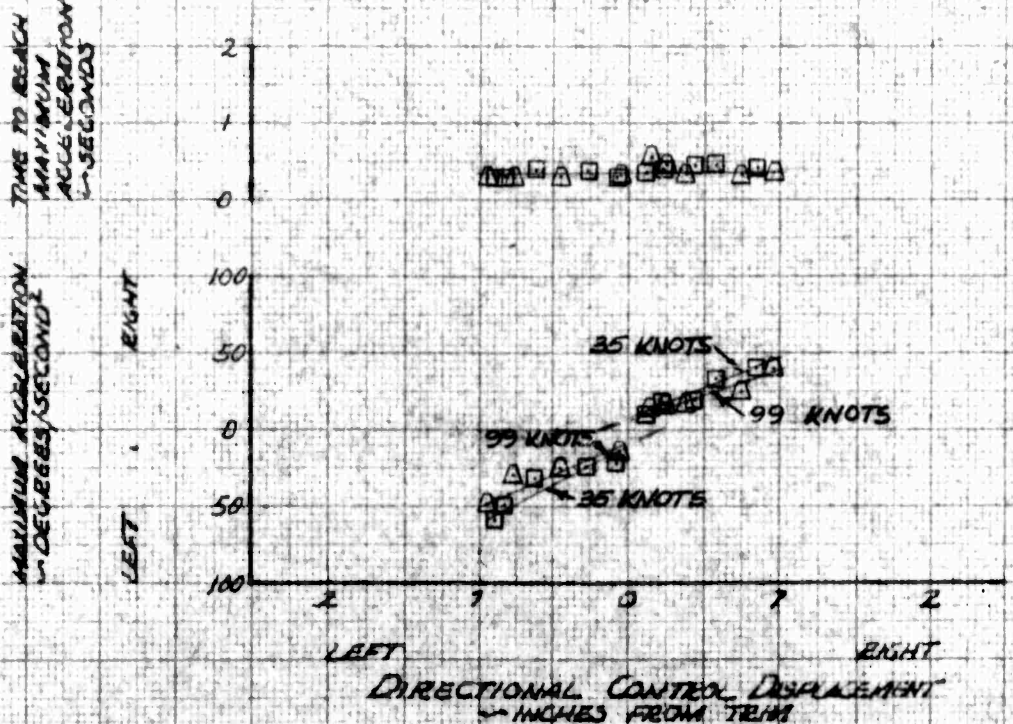
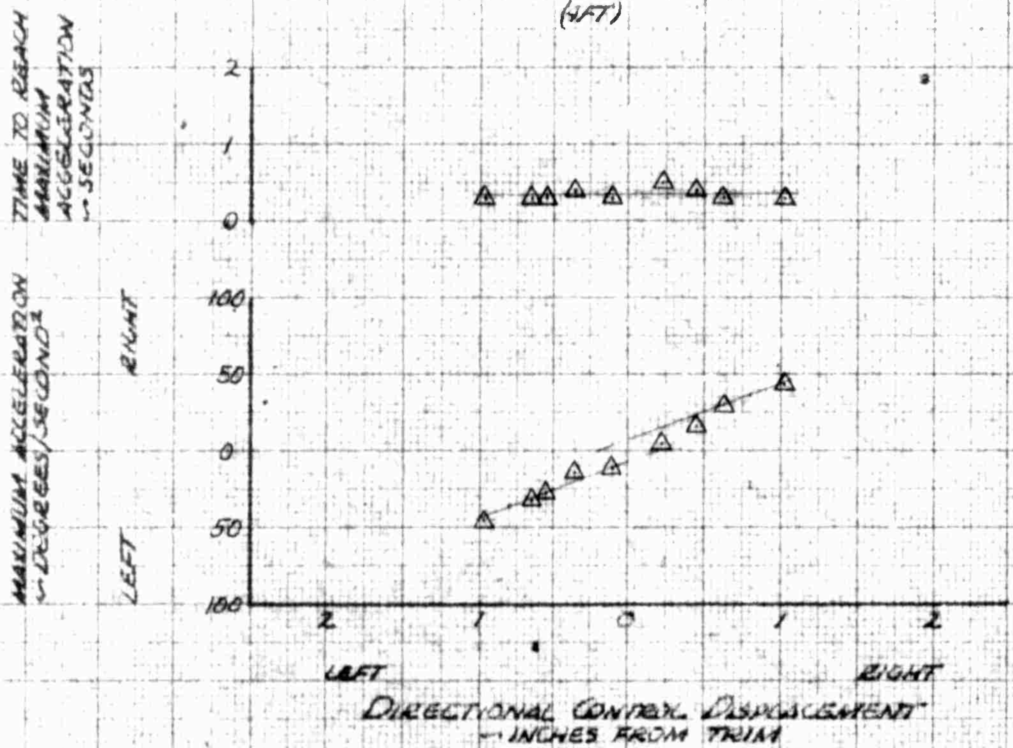


FIGURE No. 162
DIRECTIONAL CONTROL SENSITIVITY
OH-4A USA S/N 62-4204
SAE OFF

SYM	AIRSPEED ~CAS	AVG Hp ~FT	AVG G.W. ~LB	AVG C.G ~IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT. COND.
□	35 KTS	9475	2550	105.35	.35 RT	394	CLEAN	LEVEL FLIGHT
△	76 KTS	9470	2525	105.20	.35 RT	394	CLEAN	LEVEL FLIGHT
△	92 KTS	9500	2510	105.10 (AFT)	.35 RT	394	CLEAN	LEVEL FLIGHT



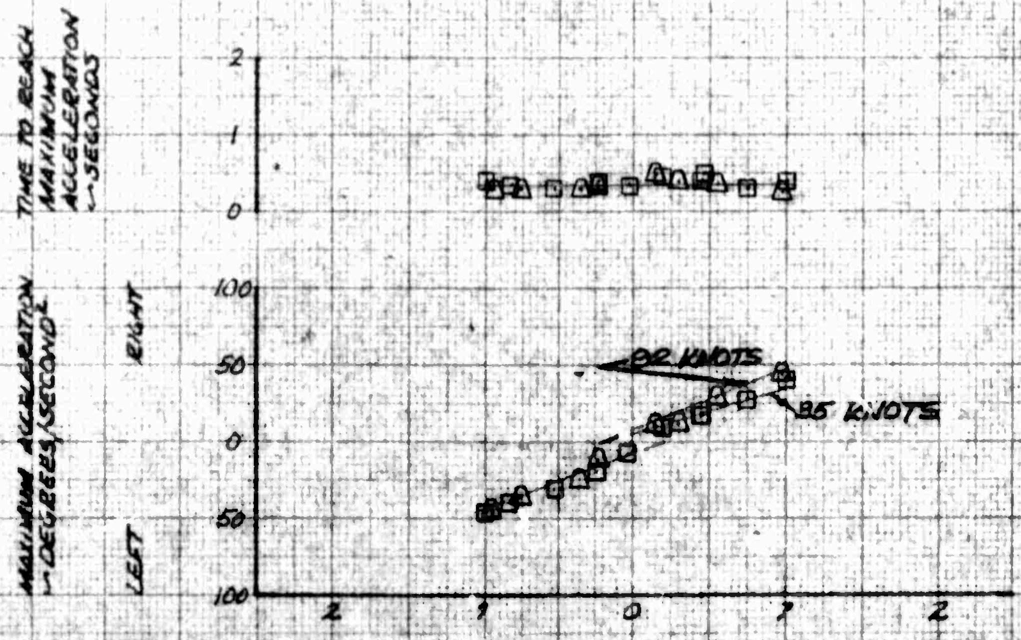


FIGURE NO. 163

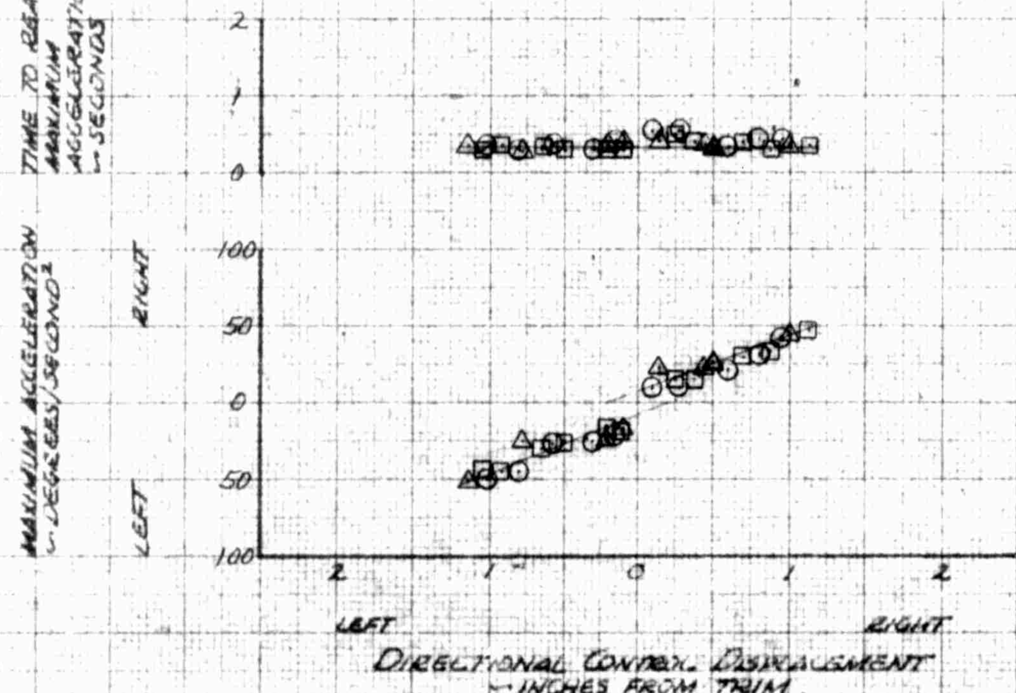
DIRECTIONAL CONTROL SENSITIVITY

OH-4A USA S/N 62-4204

SAE OFF

SYM	AIRSPEED ~CAS	AVG H_P ~FT	AVG G.W. ~LB	AVG C.G ~IN LONG	AVG C.G ~IN LAT	ROTOR RPM	CONFIGURATION	FLT. COND.
○	45 KTS	5000	2615	105.70	.35 RT	394	CLEAN	NOTED
□	45 KTS	10000	2605	105.60	.35 RT	394	CLEAN	NOTED
△	45 KTS	5000	2905	105.00 (AFT)	.75 RT	394	CLEAN	NOTED

CLIMB



AUTOROTATION

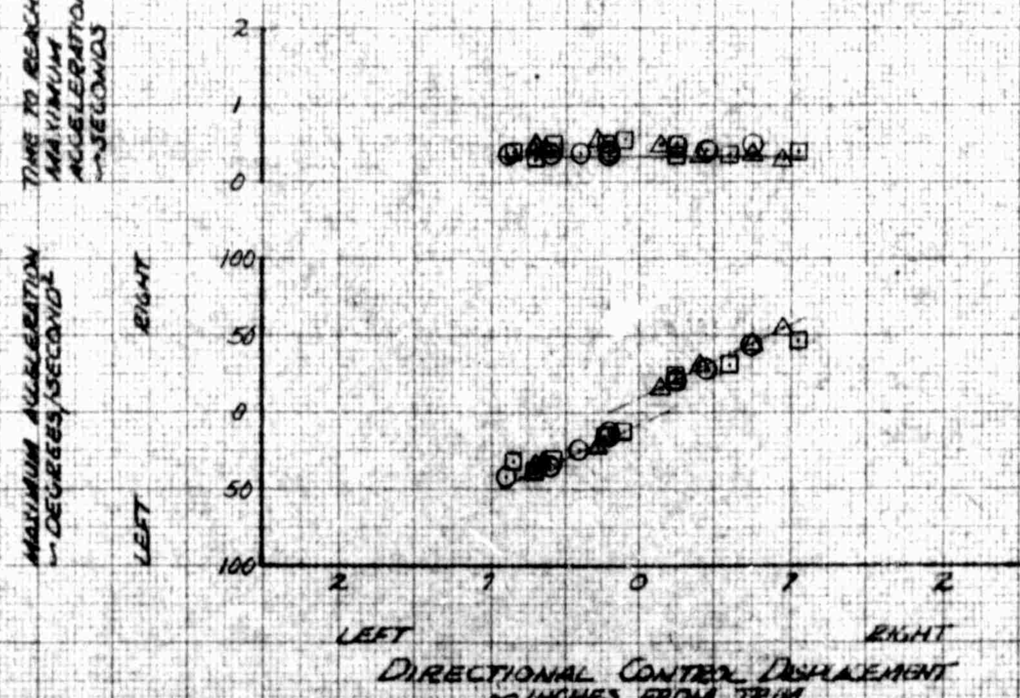
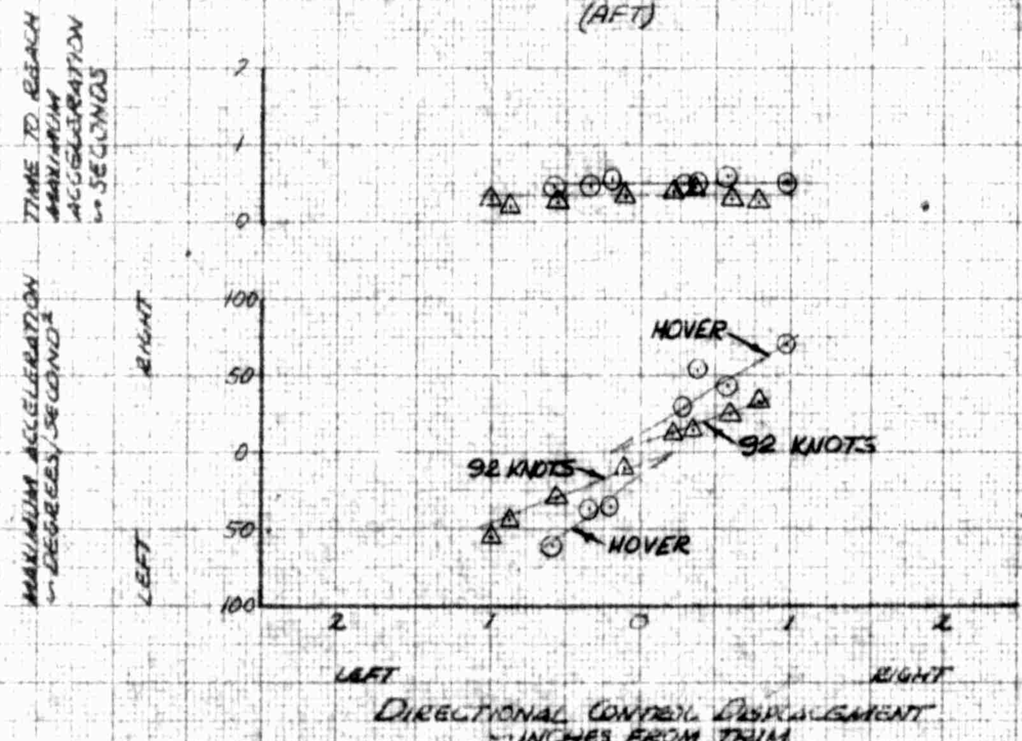


FIGURE NO. 164
DIRECTIONAL CONTROL SENSITIVITY
OH-4A USA S/N 62-4204
SAE OFF

SYM	AIRSPEED ~ CAS	AVG. Hp ~ FT	AVG. G.W. ~ LB	AVG. C.G. ~ IN LONG	AVG. C.G. ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT. COND.
○	ZERO	2050	2660	105.00	1.25 LT	394	XM-7	HOVER (IGE)
□	35 KTS	4900	2550	104.50	1.25 LT	394	XM-7	LEVEL FLIGHT
△	92 KTS	4890	2485	104.40 (AFT)	1.25 LT	394	XM-7	LEVEL FLIGHT



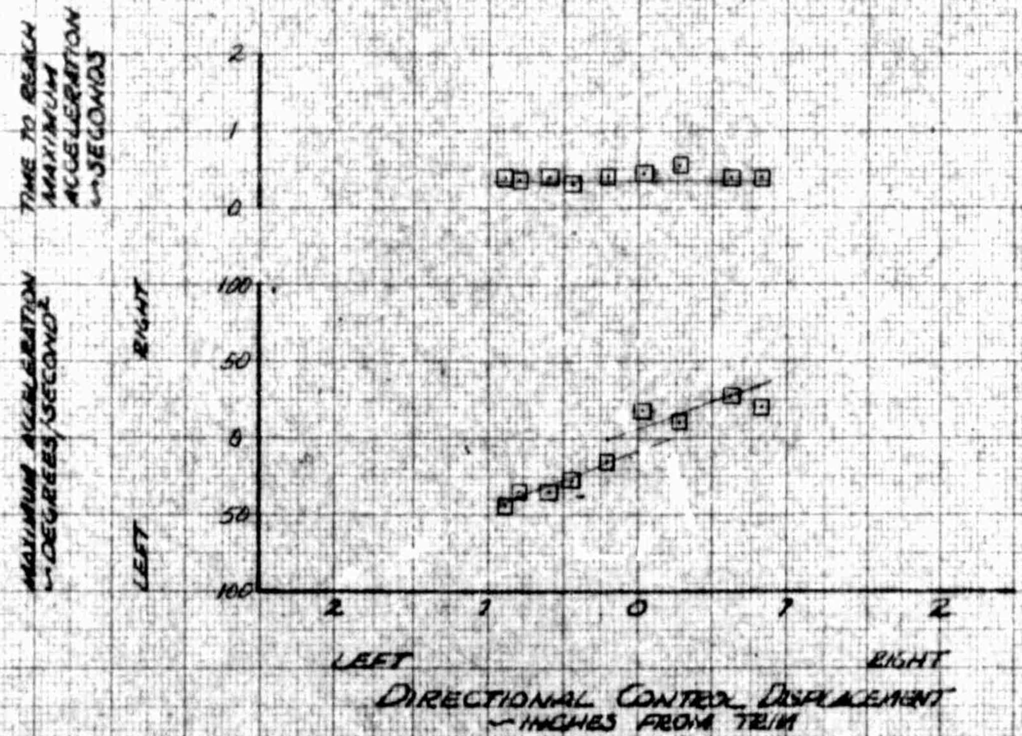
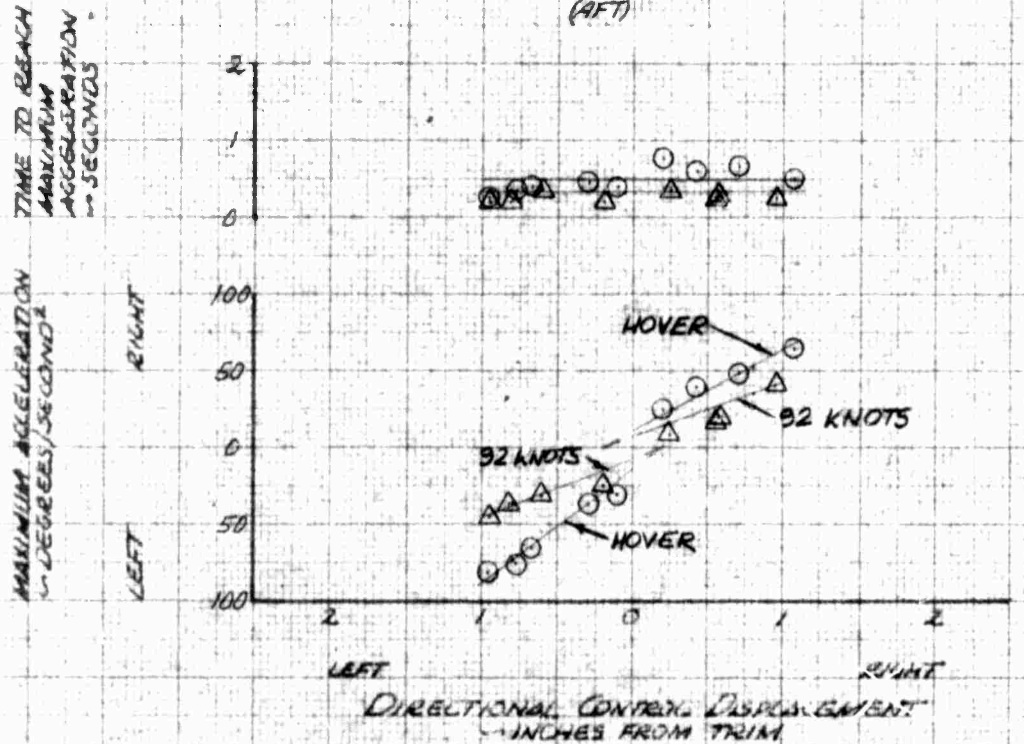


FIGURE NO. 165
DIRECTIONAL CONTROL SENSITIVITY
OH-4A USA S/N 62-4204
SAE ON

SYM	AIRSPEED ~CAS	AVG H_p ~FT	AVG G.W. ~LB.	AVG C.G. ~IN LONG	AVG C.G. ~IN LAT	ROTOR RPM	CONFIGURATION	FLT. COND.
○	ZERO	2050	2570	104.55	1.25LT	394	XM-7	HOVER (IGE)
□	35 KTS	4695	2570	104.55	1.25LT	394	XM-7	LEVEL FLIGHT
△	92 KTS	4610	2510	104.48 (AFT)	1.25LT	394	XM-7	LEVEL FLIGHT



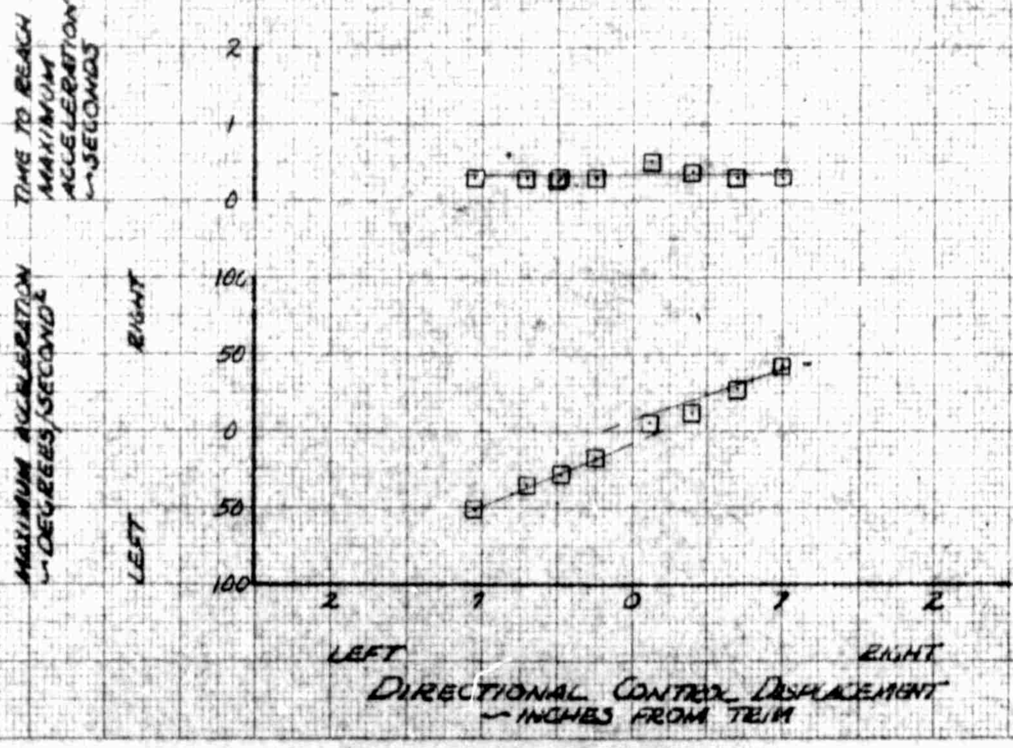
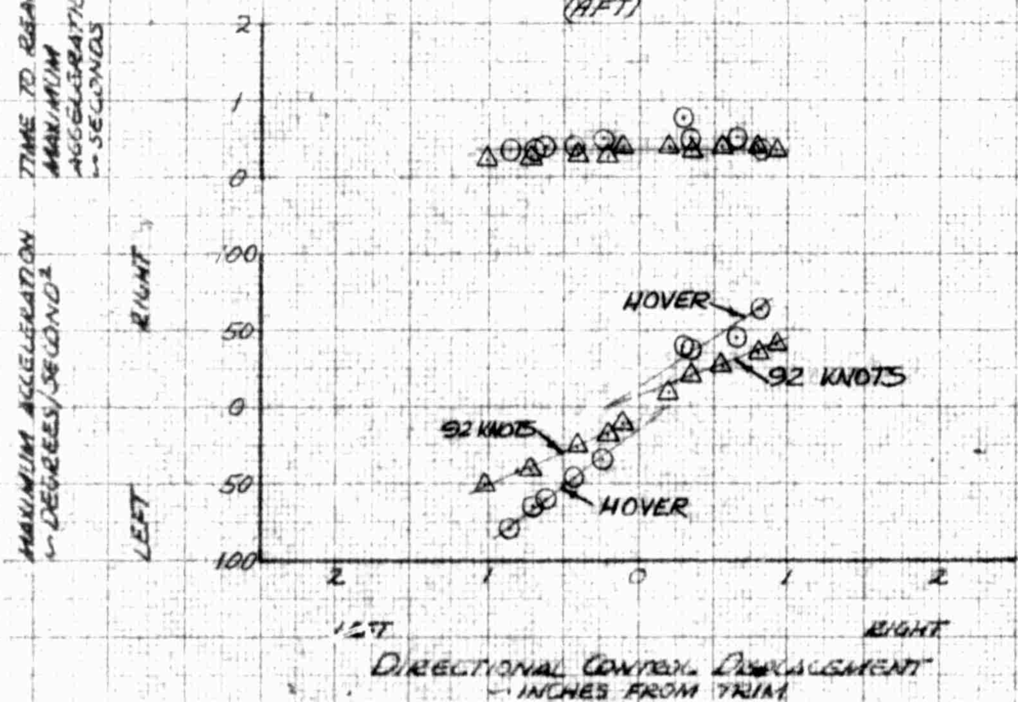


FIGURE NO. 166
DIRECTIONAL CONTROL SENSITIVITY
OH-4A USA S/N 62-4204
SAE OFF

SYM	AIRSPEED ~CAS	AVG Hp ~FT	AVG G.W. ~LB	AVG C.G. ~IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND.
○	ZERO	1740	2640	105.40	1.30LT	394	XM-8	HOVER (IGE)
□	35 KTS	4710	2590	105.00	1.30LT	394	XM-8	LEVEL FLIGHT
△	92 KTS	4775	2520	105.00	1.30LT	394	XM-8	LEVEL FLIGHT
△	98 KTS	4670	2480	104.90 (AFT)	1.30LT	394	XM-8	LEVEL FLIGHT



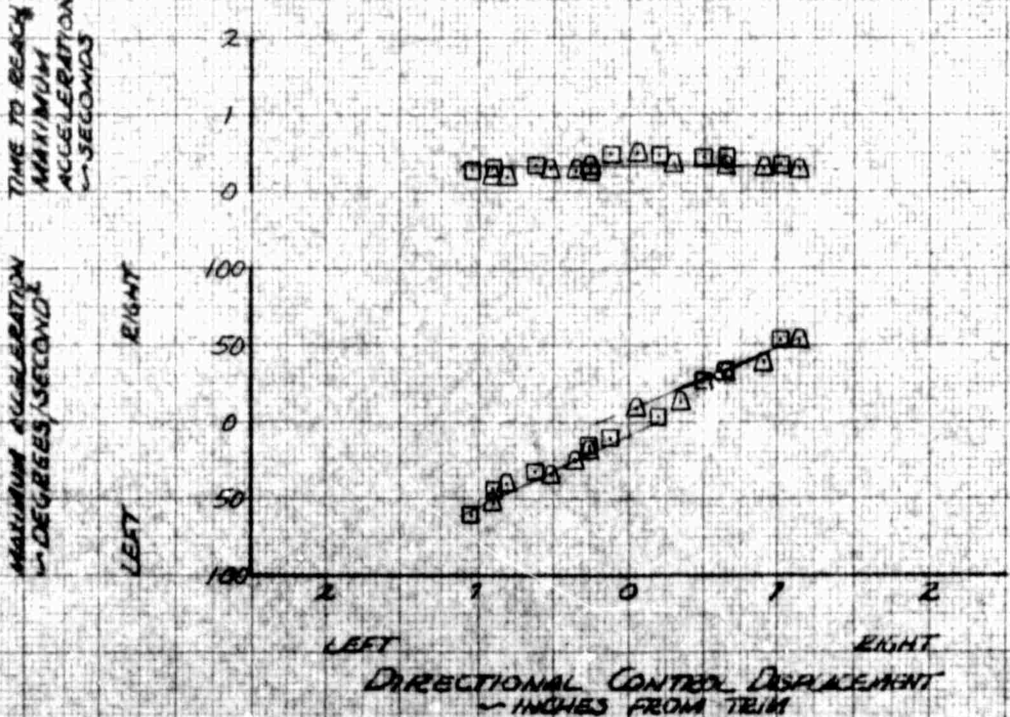
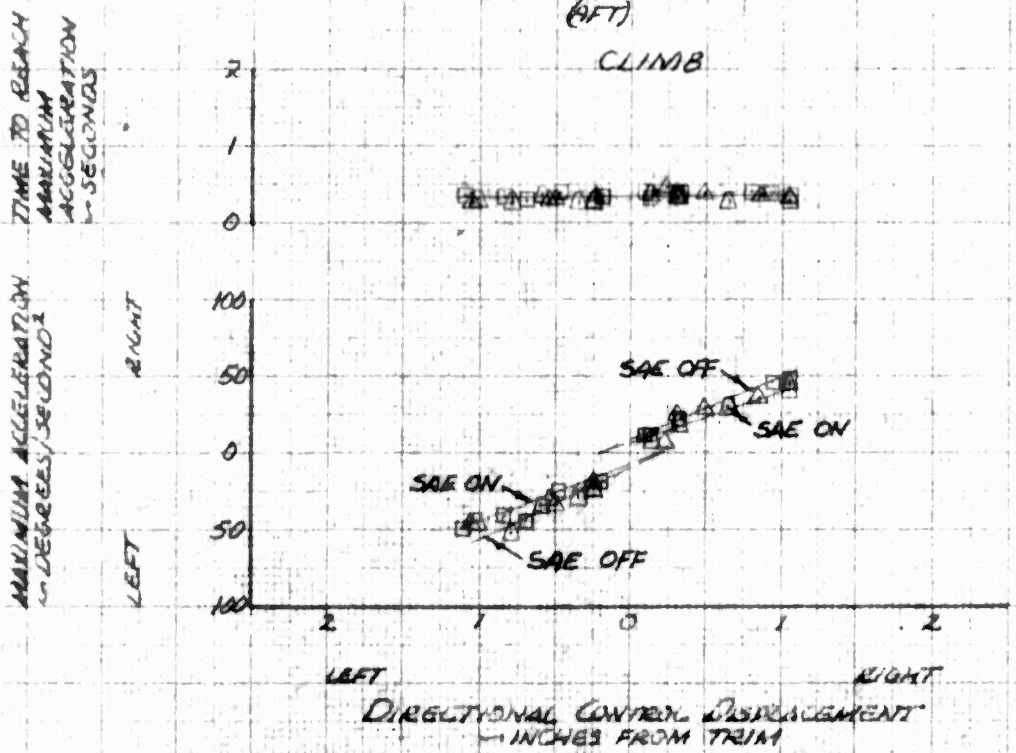
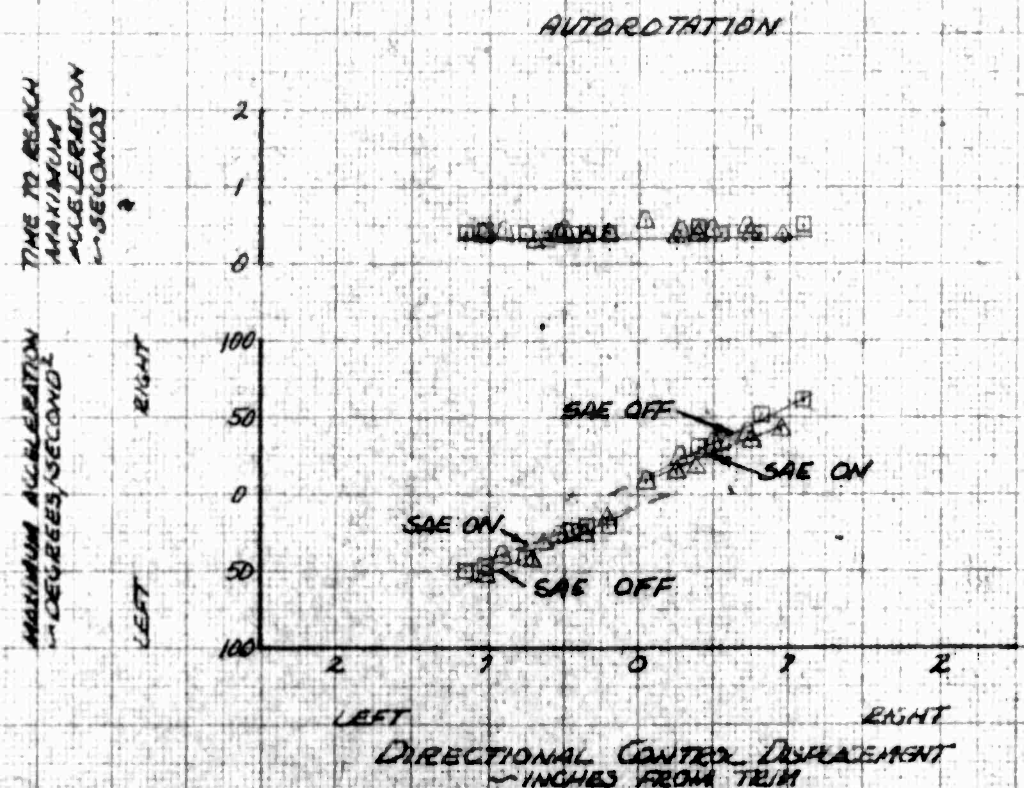


FIGURE NO. 167
DIRECTIONAL CONTROL SENSITIVITY
OH-4A USA S/N 62-4204

SYM	AIRSPEED ~ CAS	AVG Hp ~ FT	AVG G.W. ~ LB	AVG C.G ~ IN LONG	AVG C.G ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT. COND.
□	45 KTS	5000	2575	105.10	1.30 LT	394	XM-8 SAE-OFF	NOTED
△	45 KTS	5000	2600	104.70	1.25 LT	394	XM-7 SAE-ON	NOTED
△	45 KTS	5000	2660	105.00 (AFT)	1.25 LT	394	XM-7 SAE-OFF	NOTED





FOR OFFICAL USE ONLY

FIGURE NO. 168

SUMMARY OF DIRECTIONAL CONTROL RESPONSE

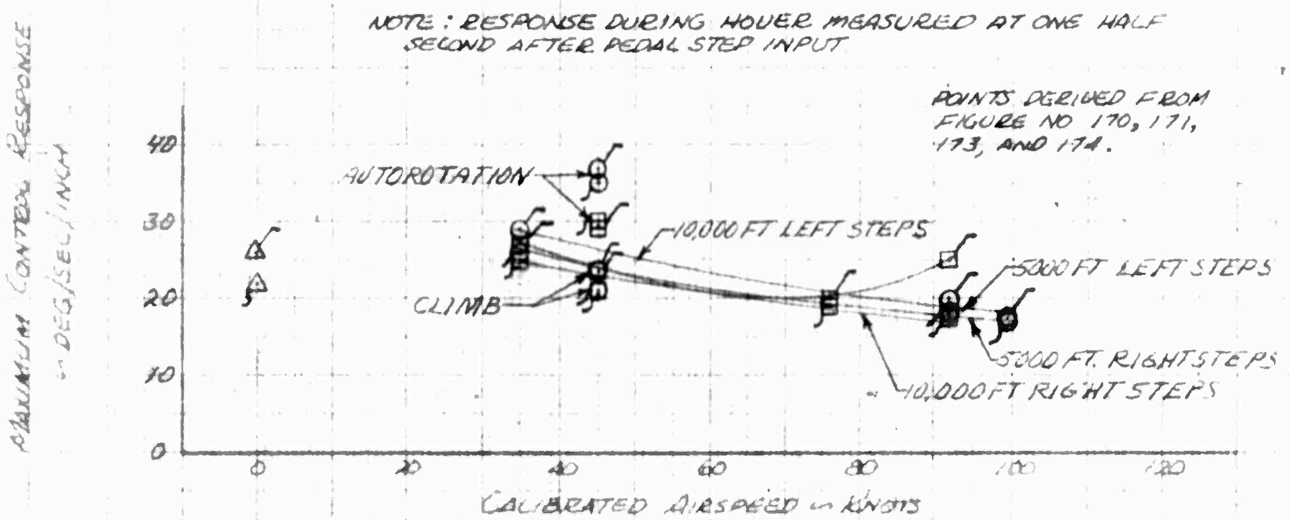
OH-4A USA S/N 62-4204

SAE-OFF

SYM	AVG Hp ~FT	AVG GW ~LB	AVG CG ~ IN LONG	AVG CG ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
△	1070	2490	105.05	.35 RT	394	CLEAN	HOVER (IGE)
○	4800	2565	105.40	.35 RT	394	CLEAN	LEVEL FLIGHT AND NOTED
□	4690	2560	105.40 (AFT)	.35 RT	394	CLEAN	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH LEFT AND RIGHT PEDAL STEPS
SYMBOLS WITH FLAGS DENOTE LEFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE RIGHT STEPS ONLY

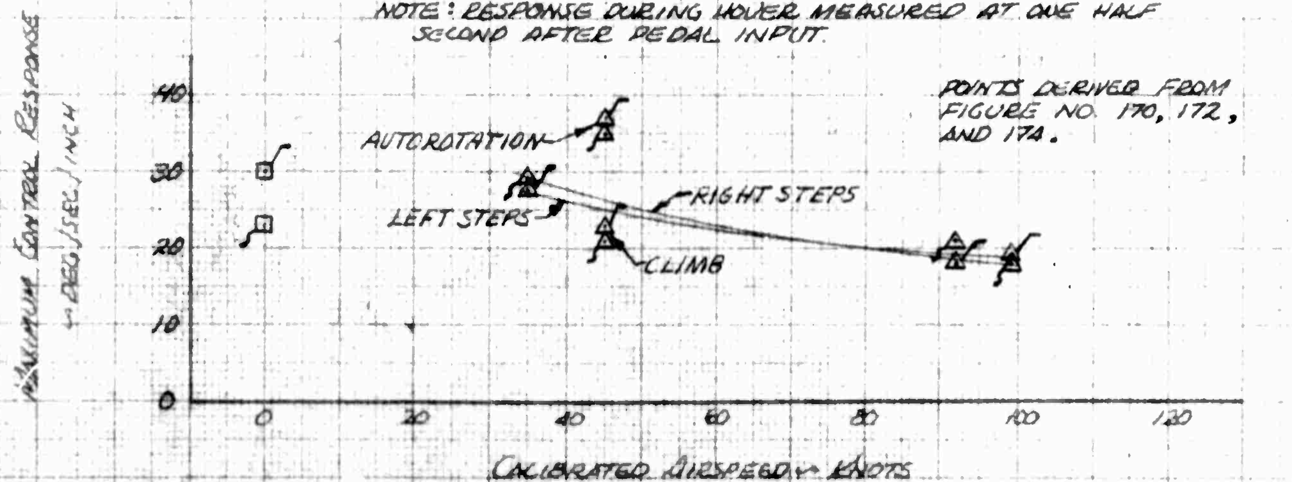
NOTE: RESPONSE DURING HOVER MEASURED AT ONE HALF SECOND AFTER PEDAL STEP INPUT



SYM	AVG Hp ~FT	AVG G.W. ~LB	AVG CG ~ IN LONG	AVG CG ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
□	1480	2950	105.30	.75 LT	394	CLEAN	HOVER (IGE)
△	4830	2870	104.80 (AFT)	.75 LT	394	CLEAN	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH LEFT AND RIGHT PEDAL STEPS
SYMBOLS WITH FLAGS DENOTE LEFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE RIGHT STEPS ONLY

NOTE: RESPONSE DURING HOVER MEASURED AT ONE HALF SECOND AFTER PEDAL INPUT.



FOR OFFICAL USE ONLY

FIGURE NO. 169

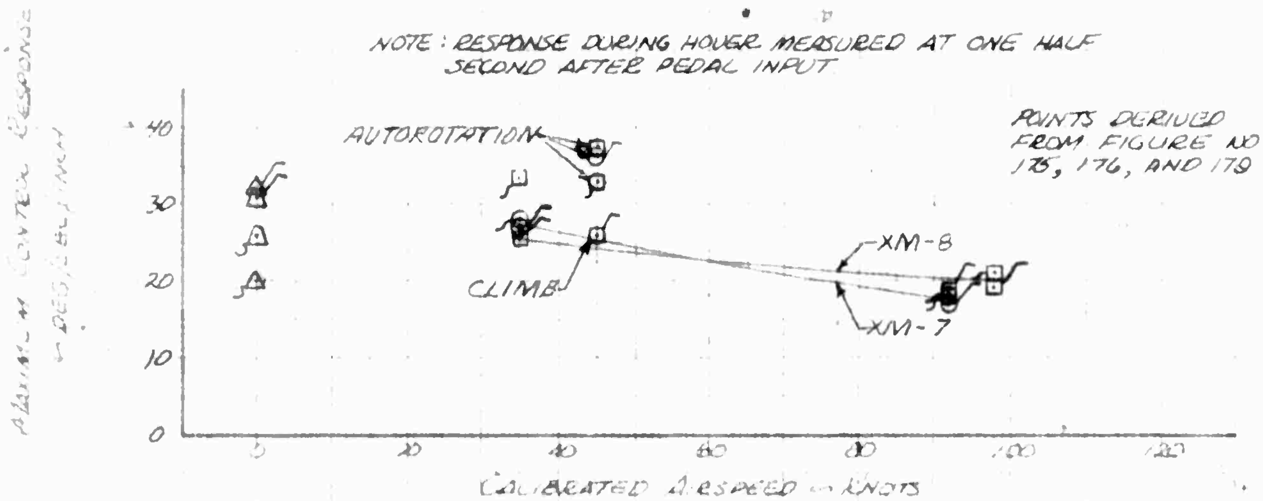
SUMMARY OF DIRECTIONAL CONTROL RESPONSE

OH-4A USA S/N 62-4204

SYM	AVG HD ~FT	AVG GW ~LB	AVG CG ~IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
△	2050	2660	105.00	1.25LT	394	XM-7 SAE OFF	HOVER (IGE)
△	1740	2640	105.40	1.30LT	394	XM-8 SAE OFF	HOVER (IGE)
○	4950	2600	104.70	1.25LT	394	XM-7 SAE OFF	LEVEL FLIGHT AND NOTED
□	4830	2540	105.00 (AFT)	1.30LT	394	XM-8 SAE OFF	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH LEFT AND RIGHT STEPS
SYMBOLS WITH FLAGS DENOTE LEFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE RIGHT STEPS ONLY

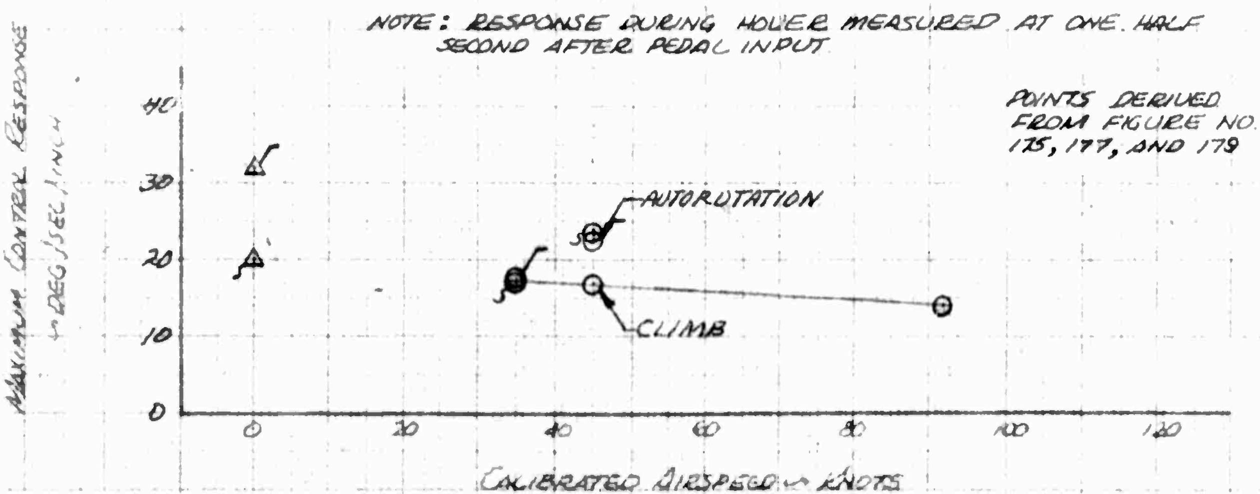
NOTE: RESPONSE DURING HOVER MEASURED AT ONE HALF SECOND AFTER PEDAL INPUT



SYM	AVG HD ~FT	AVG GW ~LB	AVG CG ~IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
△	2050	2570	104.55	1.25LT	394	XM-7 SAE ON	HOVER (IGE)
○	4820	2570	104.50 (AFT)	1.25LT	394	XM-7 SAE ON	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH LEFT AND RIGHT STEPS
SYMBOLS WITH FLAGS DENOTE LEFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE RIGHT STEPS ONLY

NOTE: RESPONSE DURING HOVER MEASURED AT ONE HALF SECOND AFTER PEDAL INPUT

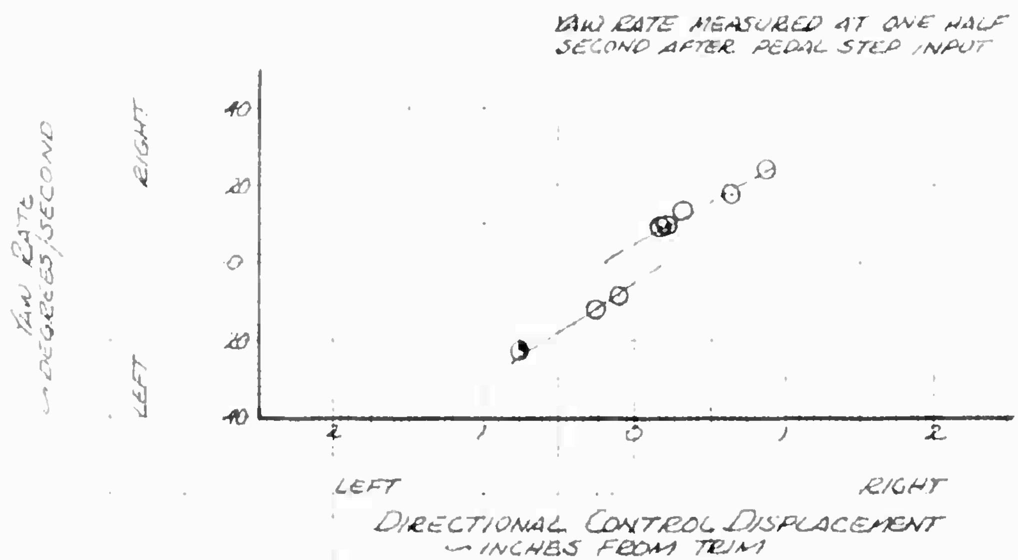


FOR OFFICAL USE ONLY

FIGURE NO 11C
DIRECTIONAL CONTROL RESPONSE
OH-4A USA S/N 62-4204

SYM	AIRSPEED ~ CAS	AVG H_D ~ FT	AVG G.W ~ LB	AVG C.G ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	1070	2490	105.05(AFT)	.35 RT.	394	CLEAN	HOVER (OGE)
□	ZERO	1480	2950	105.90(AFT)	.15 LT.	394	CLEAN	HOVER (IGE)

SAS OFF



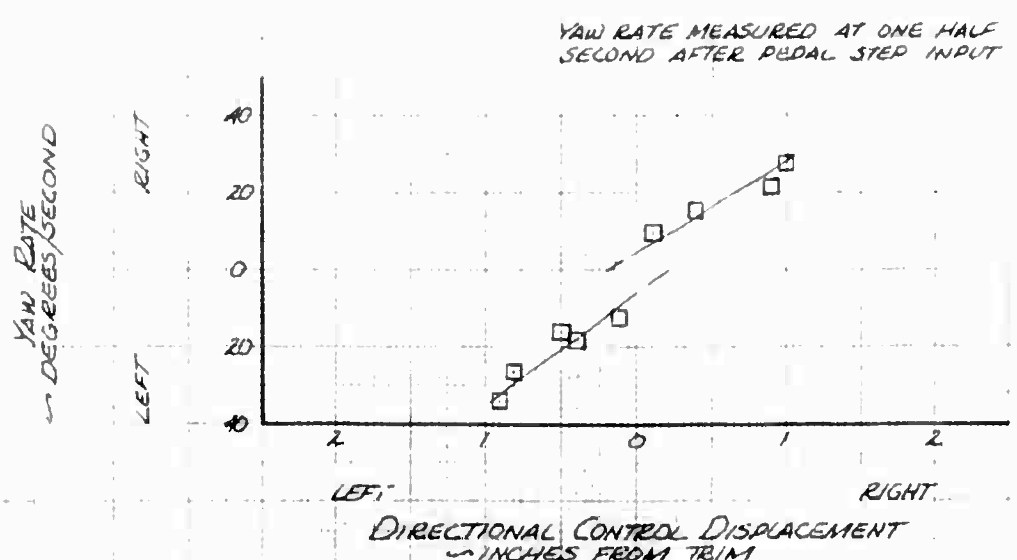


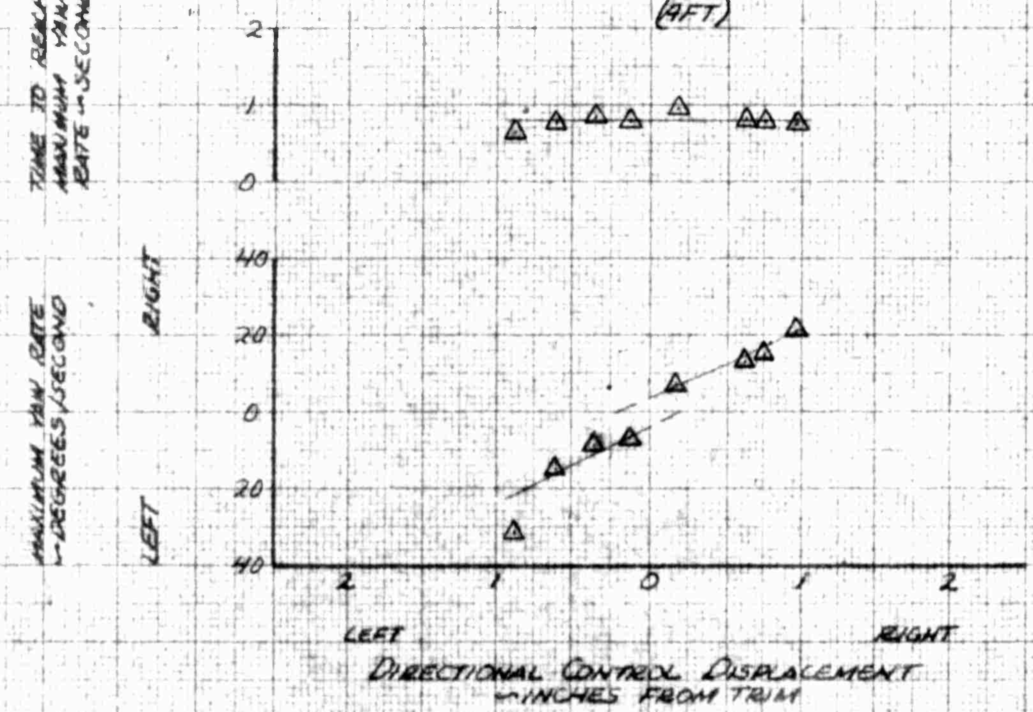
FIGURE No 171

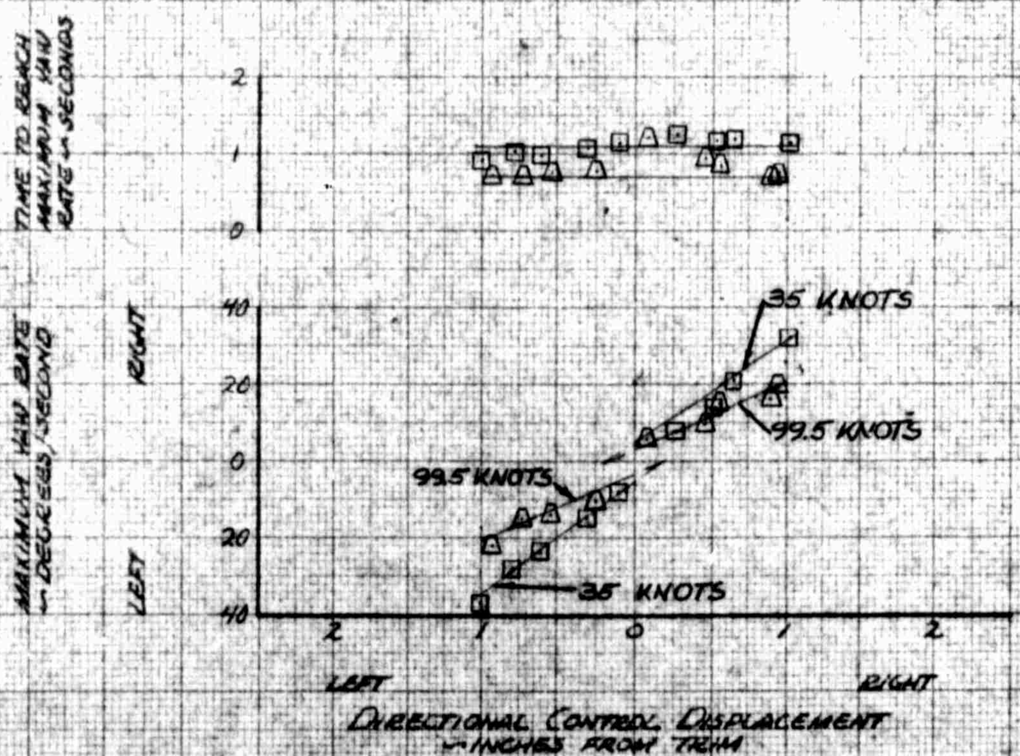
DIRECTIONAL CONTROL RESPONSE

OH-4A UOA S/N 62-4204

SAE OFF

SYM	AIRSPEED ~CAS	AVG H_o ~FT	AVG G.W. ~LB	AVG CG ~IN LONG	AVG CG ~IN LAT	ROTOR RPM	CONFIGURATION	FLT. COND.
□	35 KTS	4525	2560	105.40	.35 RT	394	CLEAN	LEVEL FLIGHT
△	92 KTS	4840	2525	105.20	.35 RT	394	CLEAN	LEVEL FLIGHT
△	99.5 KTS	4645	2505	105.10 (AFT)	.35 RT	394	CLEAN	LEVEL FLIGHT





FOR OFFICAL USE ONLY

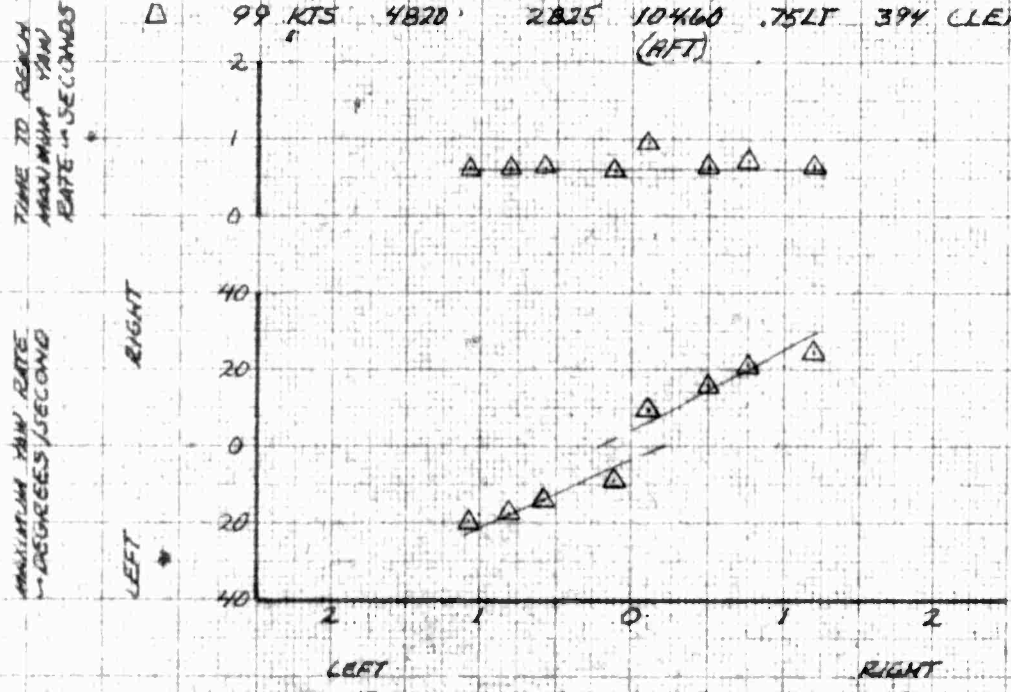
FIGURE No 172

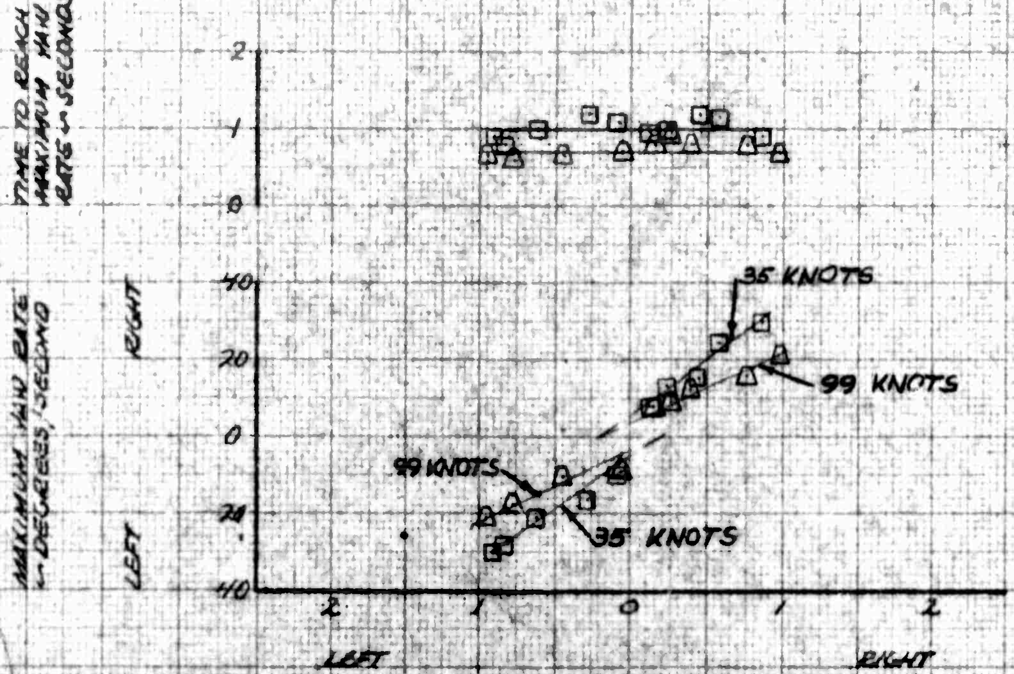
DIRECTIONAL CONTROL RESPONSE

OH-4A CDA S/N 62-4204

SAE OFF

SYM	AIRSPEED ~CAS	AVG H_p ~FT	AVG G.W. ~LB	AVG LONG CG ~IN	LAT	ROTOR RPM	CONFIGURATION	FLT COND.
□	35 KTS	4560	2870	104.80	.75LT	394	CLEAN	LEVEL FLIGHT
△	92 KTS	4780	2845	104.70	.75LT	394	CLEAN	LEVEL FLIGHT
△	99 KTS	4820	2825	104.60 (AFT)	.75LT	394	CLEAN	LEVEL FLIGHT

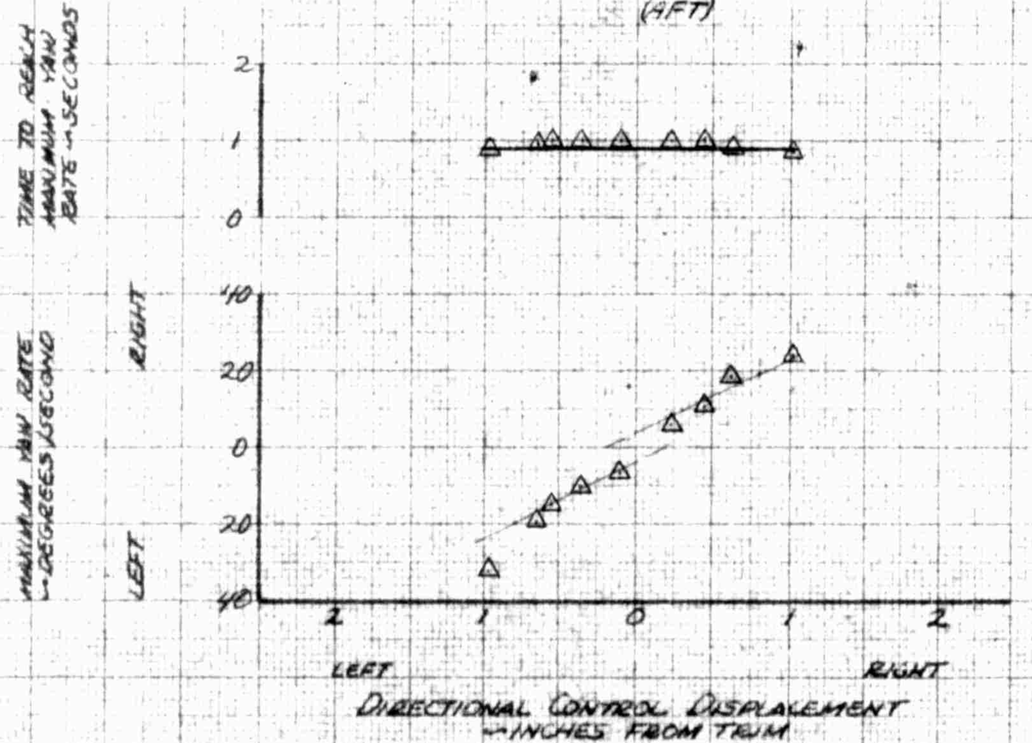


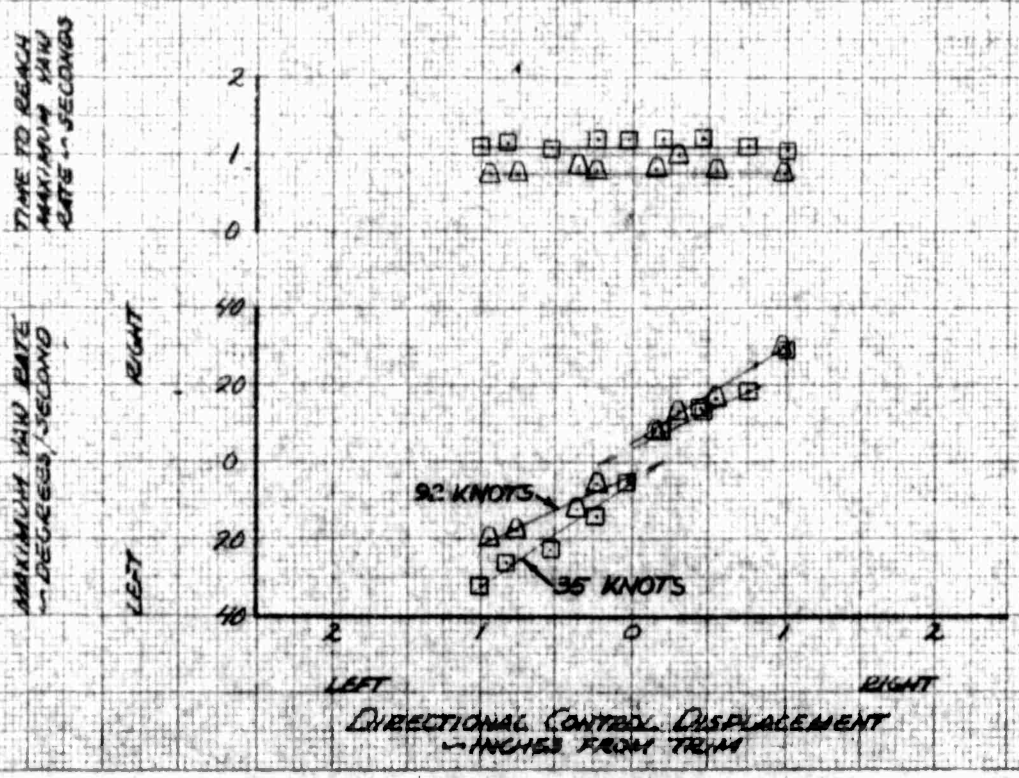


FOR OFFICAL USE ONLY

FIGURE NO 173
DIRECTIONAL CONTROL RESPONSE
OH-4A USA S/N 62-4204
SAE OFF

SYM	AIRSPEED ~CAS	AVG H_0 ~FT	AVG G.W. ~LB	AVG CG ~IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND.
□	35 KTS	9475	2550	105.35	.35 RT	394	CLEAN	LEVEL FLIGHT
△	76 KTS	9470	2525	105.20	.35 RT	394	CLEAN	LEVEL FLIGHT
△	92 KTS	9500	2510	105.10* (AFT)	.35 RT	394	CLEAN	LEVEL FLIGHT

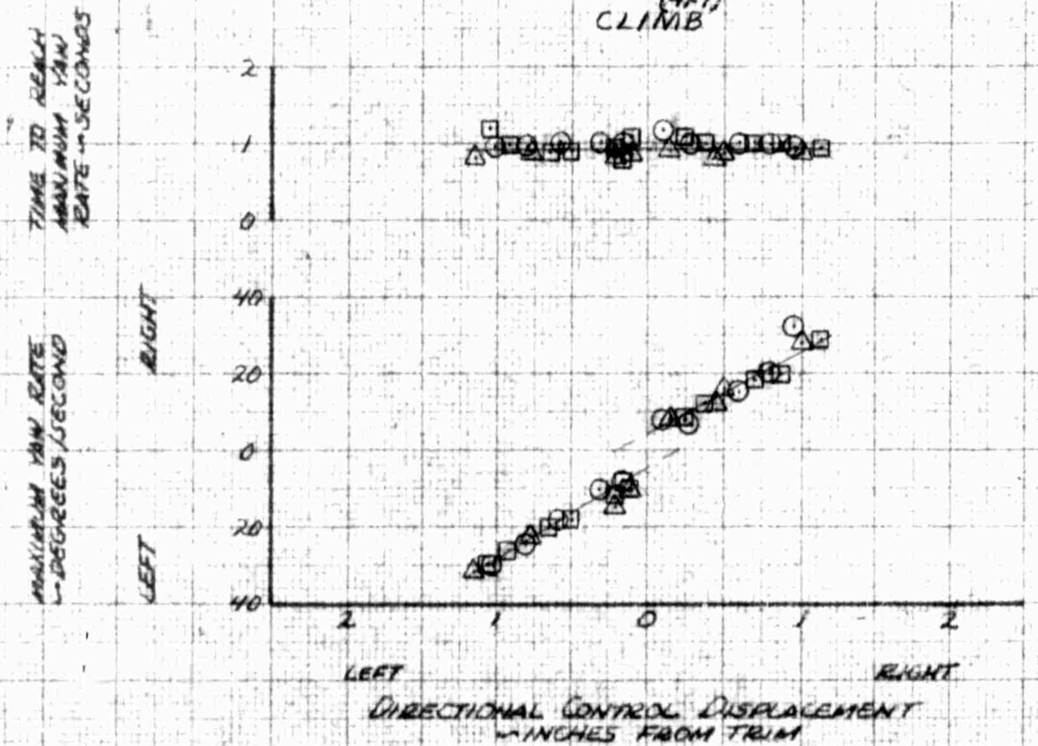


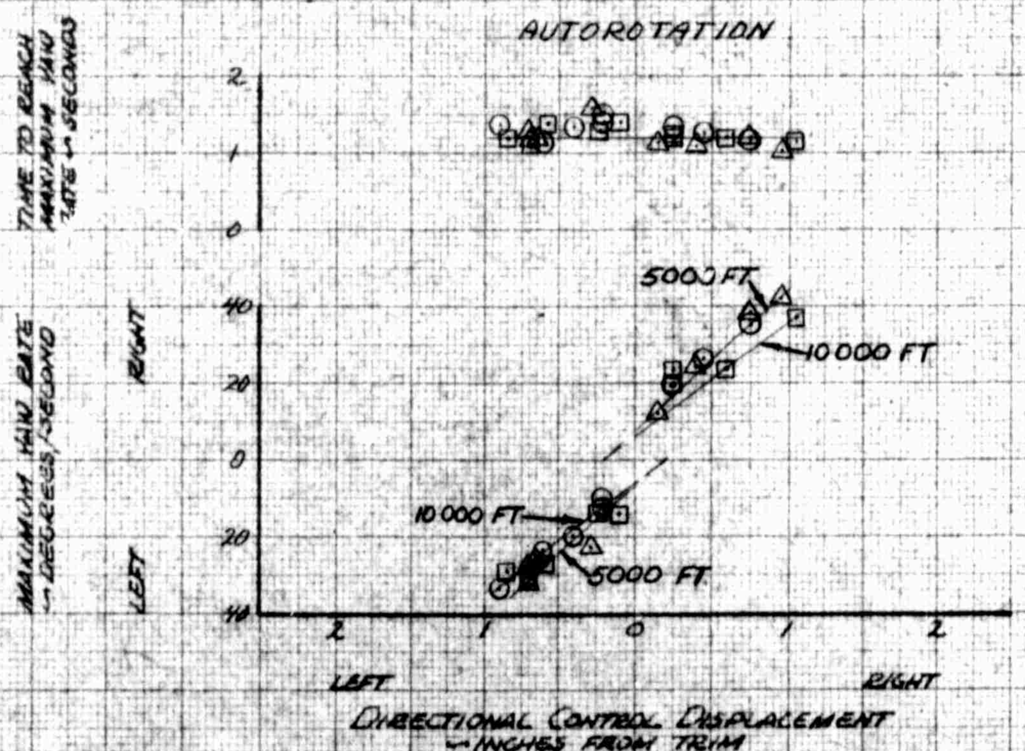


FOR OFFICAL USE ONLY

FIGURE NO 174
DIRECTIONAL CONTROL RESPONSE
OH-4A BBA S/N 62-4204
SAE OFF

SYM	AIRSPEED ~CAS	AVG H_D ~FT	AVG G.W. ~LB	AVG CG ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	45 KTS	5000	2615	105.70	.35 RT	394	CLEAN	NOTED
□	45 KTS	10000	2605	105.60	.35 RT	394	CLEAN	NOTED
△	45 KTS	5000	2905	105.00 (AFT)	.75 RT	394	CLEAN	NOTED



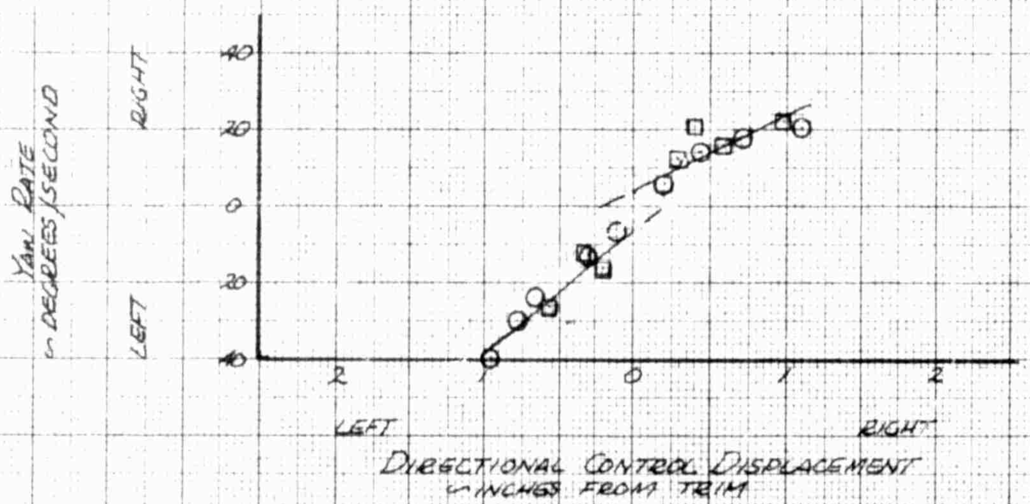


FOR OFFICAL USE ONLY

FIGURE No 175
DIRECTIONAL CONTROL RESPONSE
OH-4A USA S/N 62-4204

SYM	AIRSPEED ~CAS	AVG Ho ~FT	AVG G.W. ~LB	AVG CG ~IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND	SAE
○	ZERO	2050	2570	104.6(AFT)	1.25 LT	394	XM-7	HOVER (IGE)	ON
□	ZERO	2050	2550	104.5(AFT)	1.25 LT	394	XM-7	HOVER (IGE)	OFF
△	ZERO	1740	2620	105.3(AFT)	1.30 LT	394	XM-8	HOVER (IGE)	ON
◬	ZERO	1740	2640	105.5(AFT)	1.30 LT	394	XM-8	HOVER (IGE)	OFF

YAW RATE MEASURED AT ONE HALF
SECOND AFTER PEDAL INPUT



YAW RATE MEASURED AT ONE HALF
SECOND AFTER CONTROL INPUT

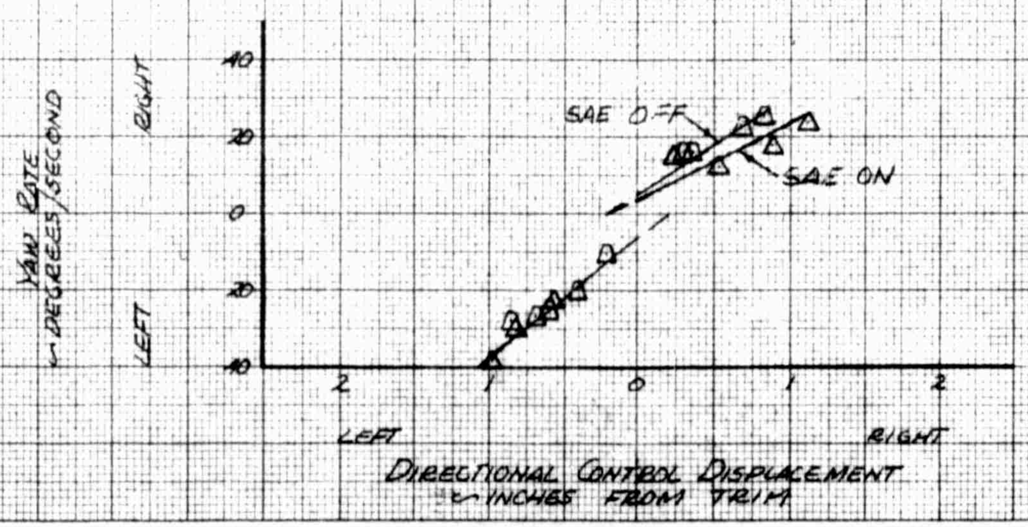
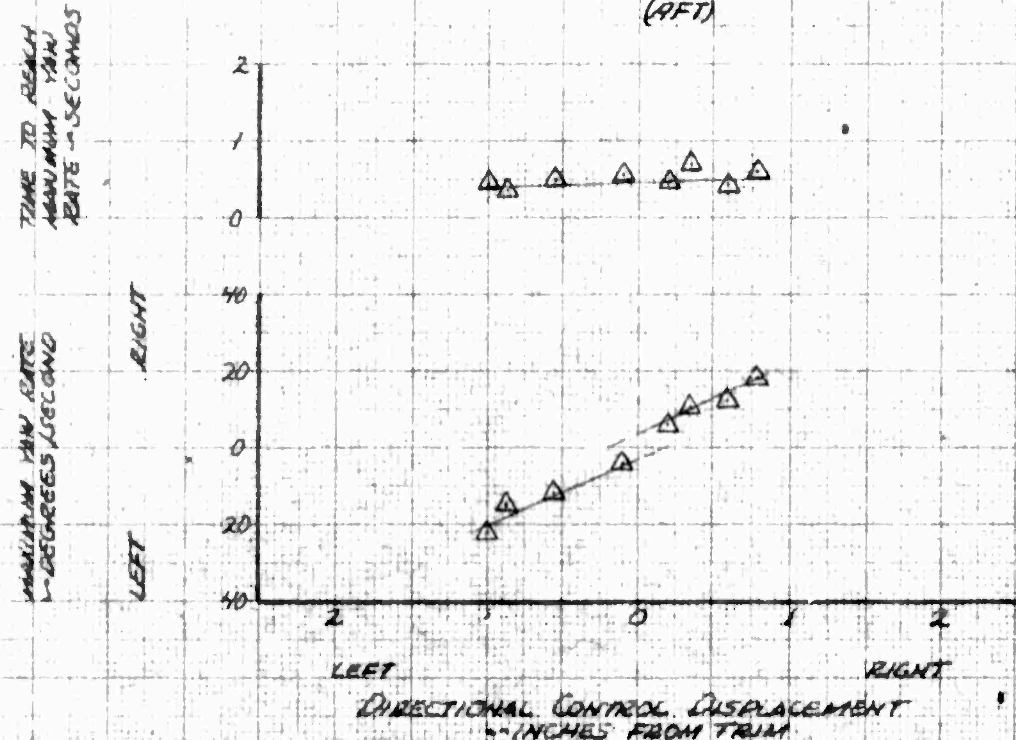
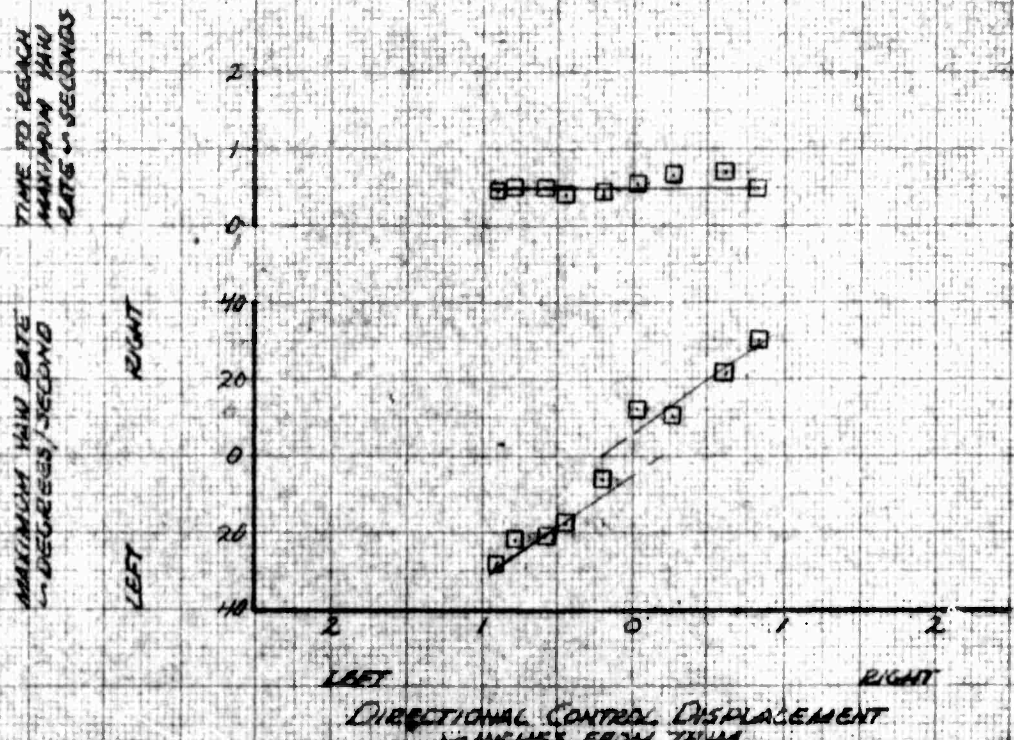


FIGURE NO 176
DIRECTIONAL CONTROL RESPONSE
OH-4A USA S/N 62-4204
SAE OFF

SYM	AIRSPEED ~ CAS	AVG H_D ~ FT	AVG G.W. ~ LB	AVG CG ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND.
□	35 KTS	4900	2550	104.50	1.25LT	394	XM-7	LEVEL FLIGHT
△	92 KTS	4890	2485	104.40 (AFT)	1.25LT	394	XM-7	LEVEL FLIGHT





FOR OFFICAL USE ONLY

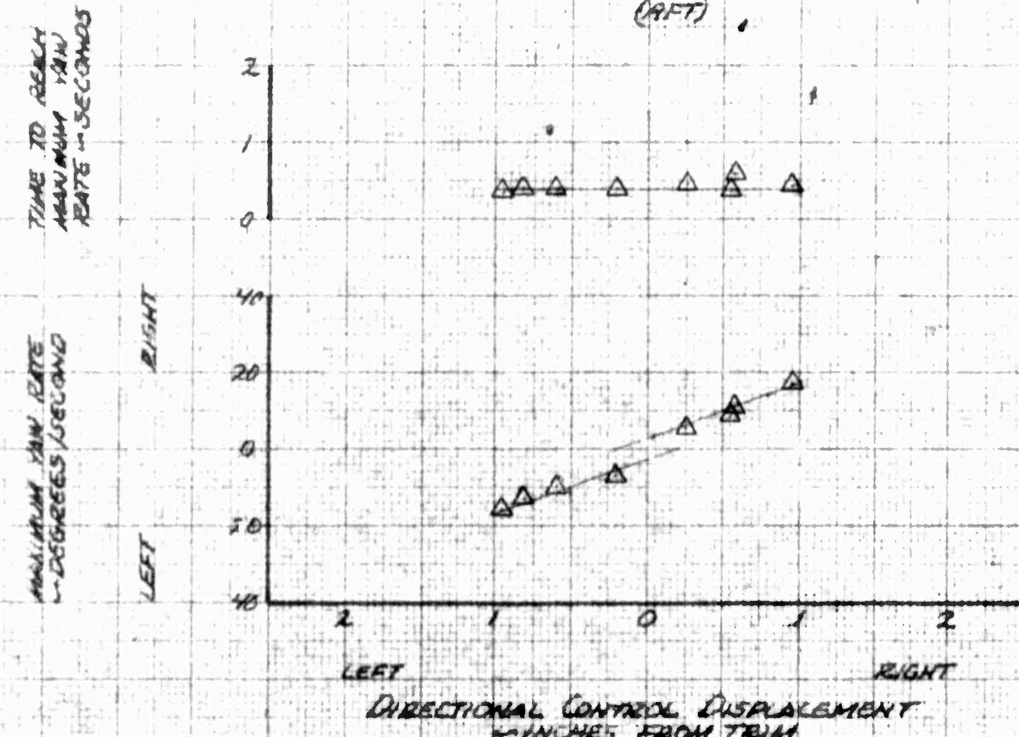
FIGURE NO. 117

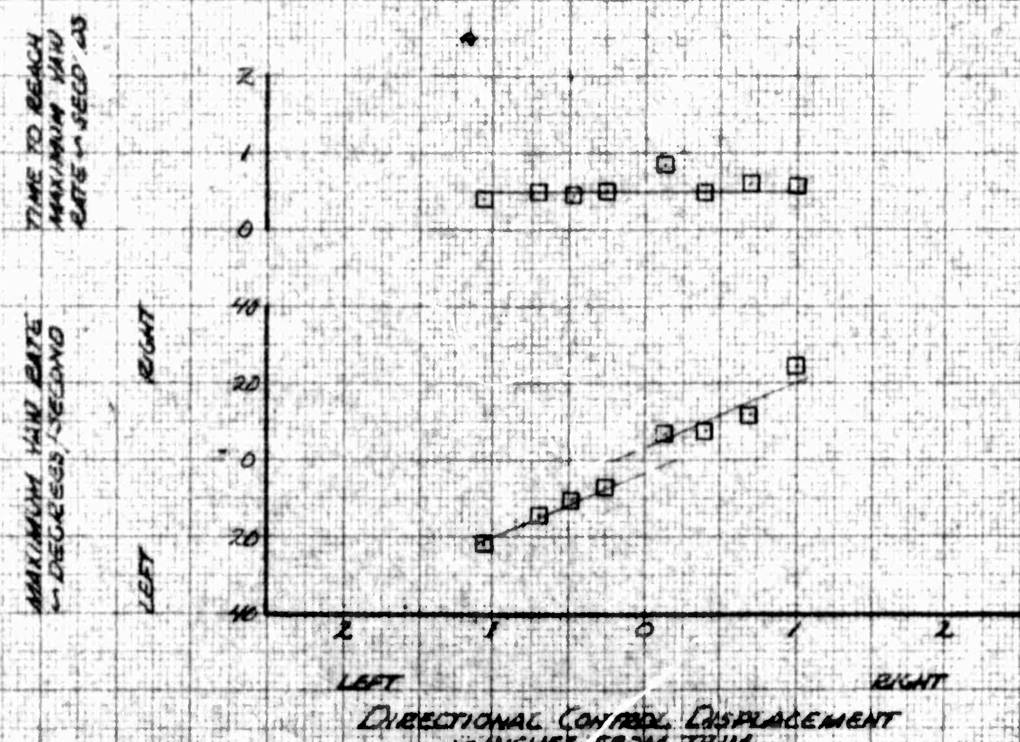
DIRECTIONAL CONTROL RESPONSE

OH-4A OOA S/N 62-4204

SAE ON

SYM	AIRSPEED ~ CAS	AVG H_O ~ FT	AVG G.W. ~ LB	AVG CG ~ IN LONG	AVG CG ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT COND.
□	35 KTS	4695	2570	104.55	1.25 LT	394	XM-7	LEVEL FLIGHT
△	92 KTS	4610	2510	104.40 (AFT)	1.25 LT	394	XM-7	LEVEL FLIGHT

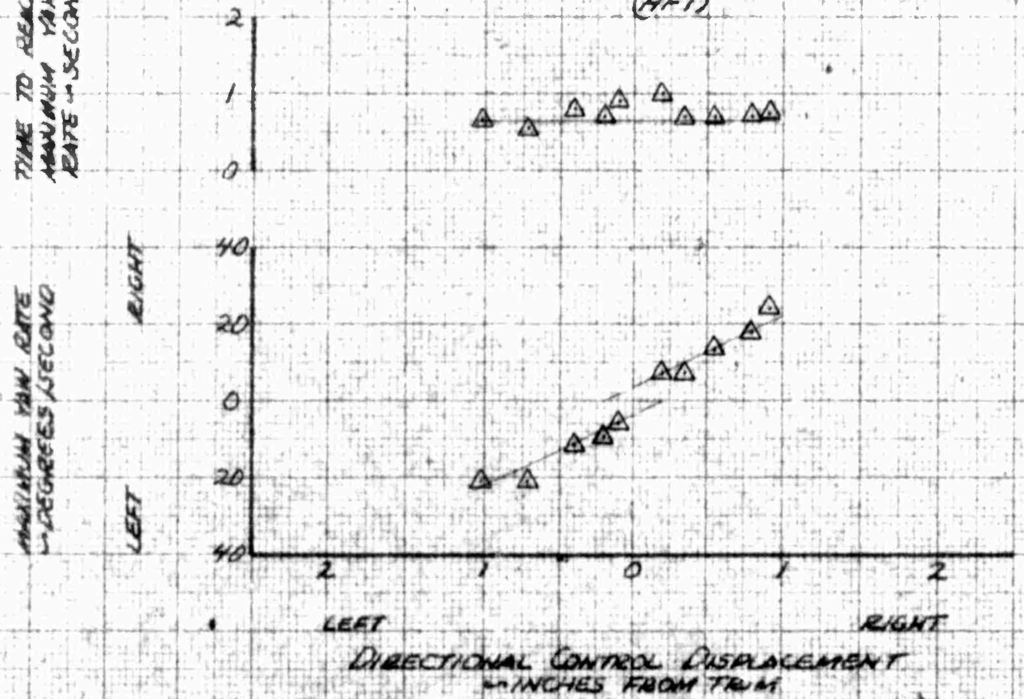




FOR OFFICAL USE ONLY

FIGURE No 178
DIRECTIONAL CONTROL RESPONSE
CH-4A USA S/N 62-4204
SAE OFF

SYM	AIRSPEED ~KCAS	AVG H_o ~FT	AVG G.W. ~LB	AVG CG ~IN LONG	AVG CG ~IN LAT	ROTOR RPM	CONFIGURATION	FLT COND.
□	35 KTS	4710	2540	105.00	1.30 LT	394	XM-8	LEVEL FLIGHT
△	92 KTS	4770	2520	105.00	1.30 LT	394	XM-8	LEVEL FLIGHT
△	98 KTS	4670	2480	104.90 (AFT)	1.30 LT	394	XM-8	LEVEL FLIGHT



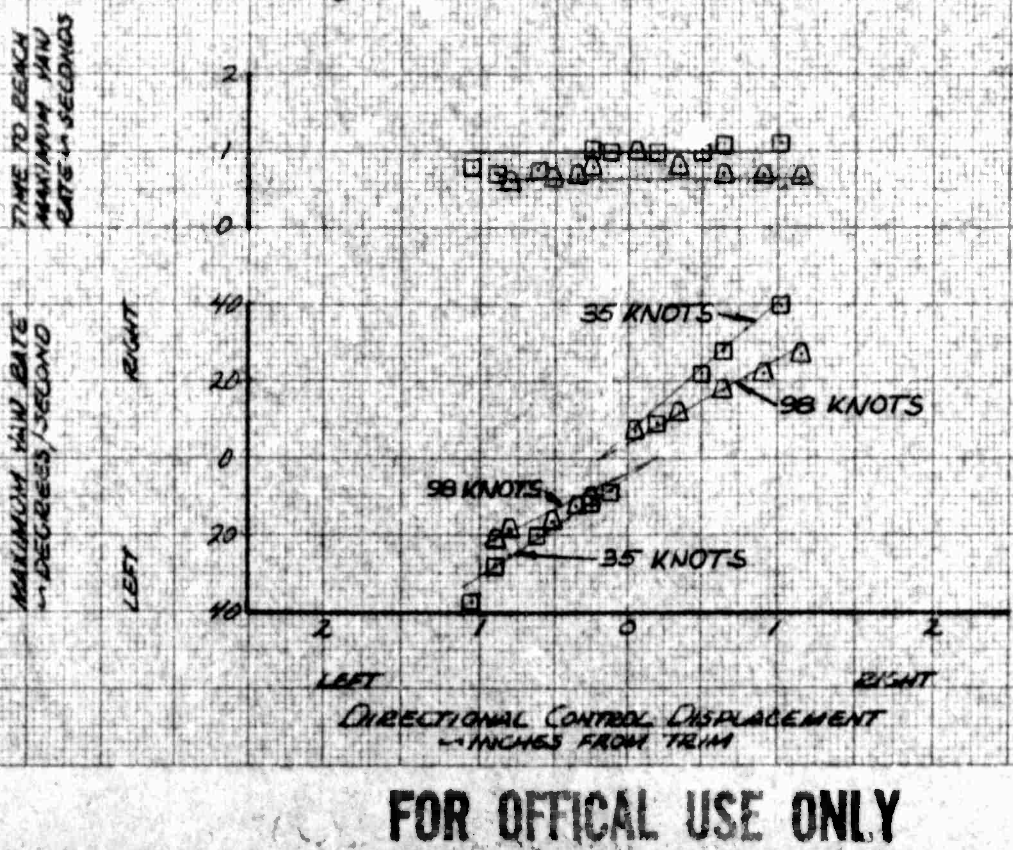
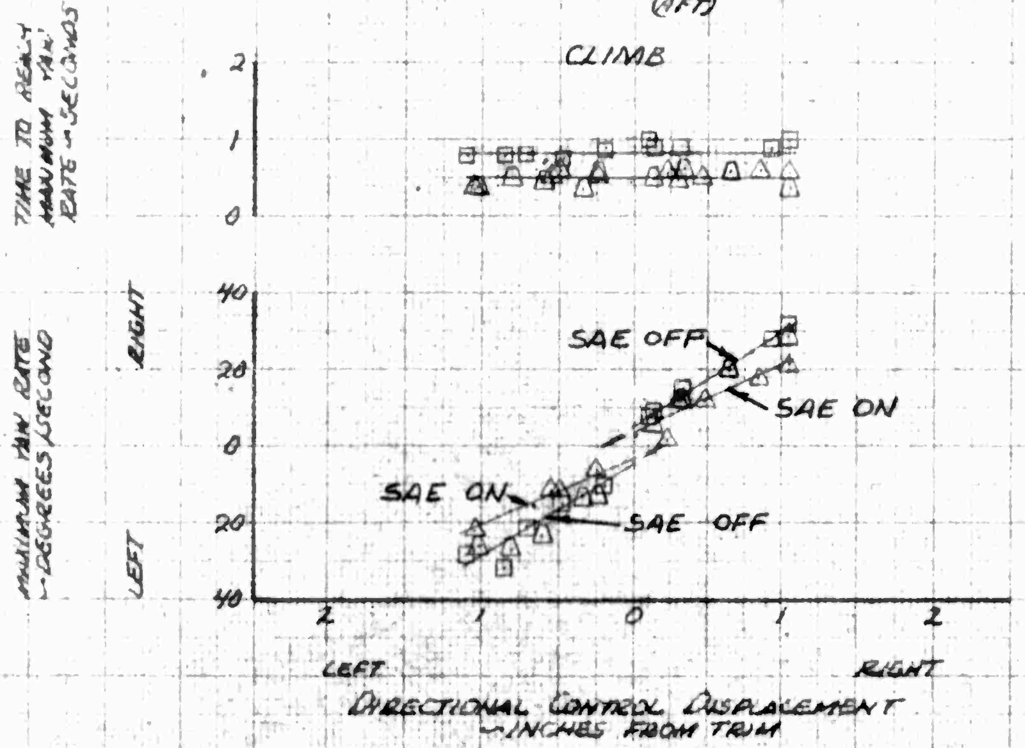


FIGURE NO 179
DIRECTIONAL CONTROL RESPONSE
OH-4A USA S/N 62-4204

SYM	AIRSPEED ~CAS	AVG H_o ~FT	AVG G.W. ~LB	AVG CG ~IN LONG	LAT	ROTOR RPM	CONFIGURATION		FLT. COND.
□	45 KTS	5000	2575	105.10	1.30 LT.	394	XM-8	SAE-OFF	NOTED
△	45 KTS	5000	2600	104.70	1.25 LT	394	XM-7	SAE-ON	NOTED
◭	45 KTS	5000	2660	105.00 (AFT)	1.25 LT	394	XM-7	SAE-OFF	NOTED



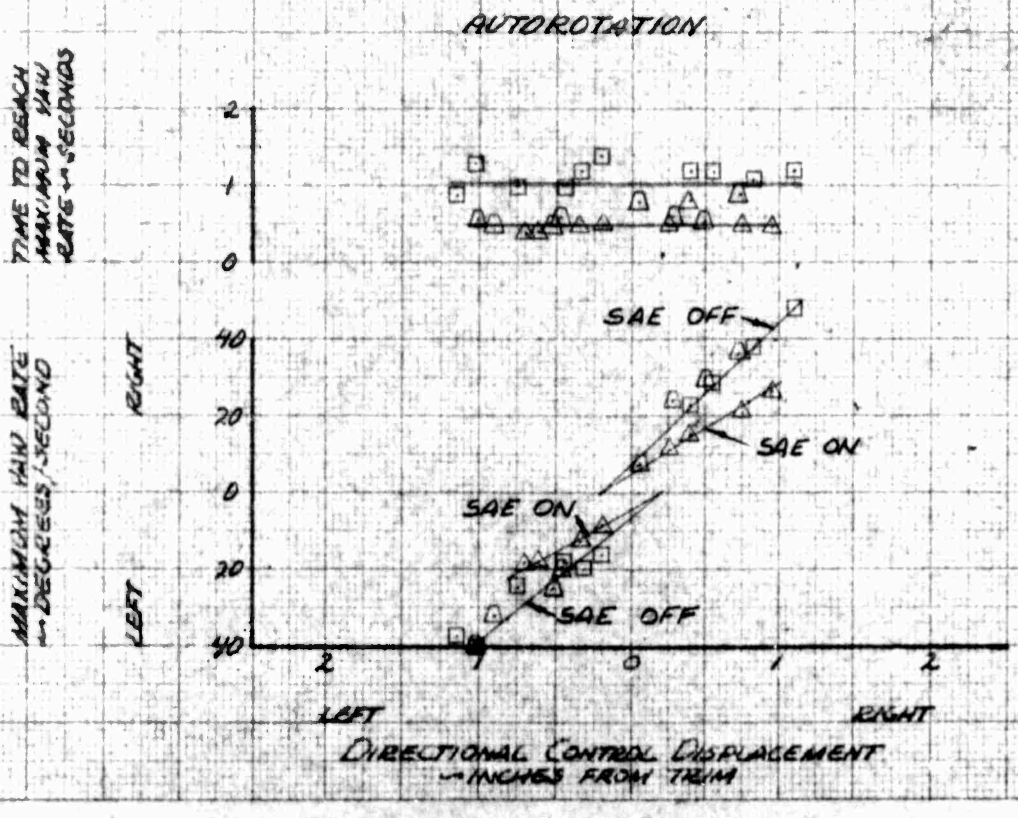


FIGURE NO. 180

SUMMARY OF ANGULAR YAW DISPLACEMENT

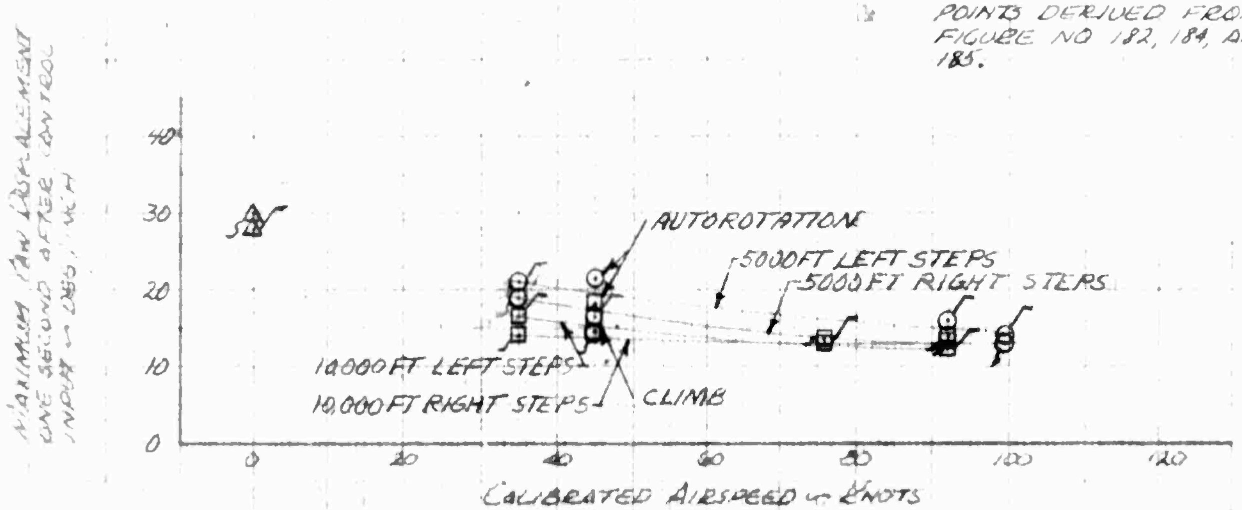
OH-4A USA S/N 62-4204

SAE-OFF

SYM	AVG H_P ~ FT	AVG G W ~ LB	AVG CG ~ IN LONG	AVG CG ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
△	1070	2490	105.05	.35 RT	394	CLEAN	HOVER (IGE)
○	4800	2565	105.40	.35 RT	394	CLEAN	LEVEL FLIGHT AND NOTED
□	9690	2560	105.40 (AFT)	.35 RT	394	CLEAN	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH LEFT AND RIGHT STEPS
SYMBOLS WITH FLAGS DENOTE LEFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE RIGHT STEPS ONLY

POINTS DERIVED FROM FIGURE NO 182, 184, AND 185.



SYM	AVG H_P ~ FT	AVG G.W. ~ LB	AVG CG ~ IN LONG	AVG CG ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
□	1480	2950	105.30	.75 LT	394	CLEAN	HOVER (IGE)
△	4830	2870	104.80 (AFT)	.75 LT	394	CLEAN	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH LEFT AND RIGHT STEPS
SYMBOLS WITH FLAGS DENOTE LEFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE RIGHT STEPS ONLY

POINTS DERIVED FROM FIGURE NO 183 AND 185.

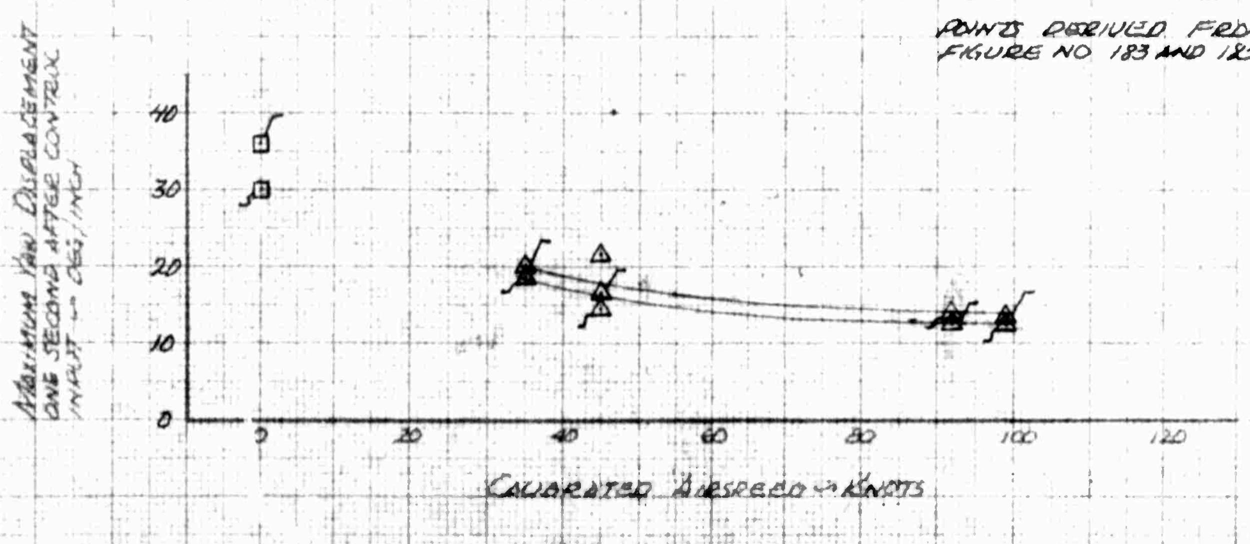
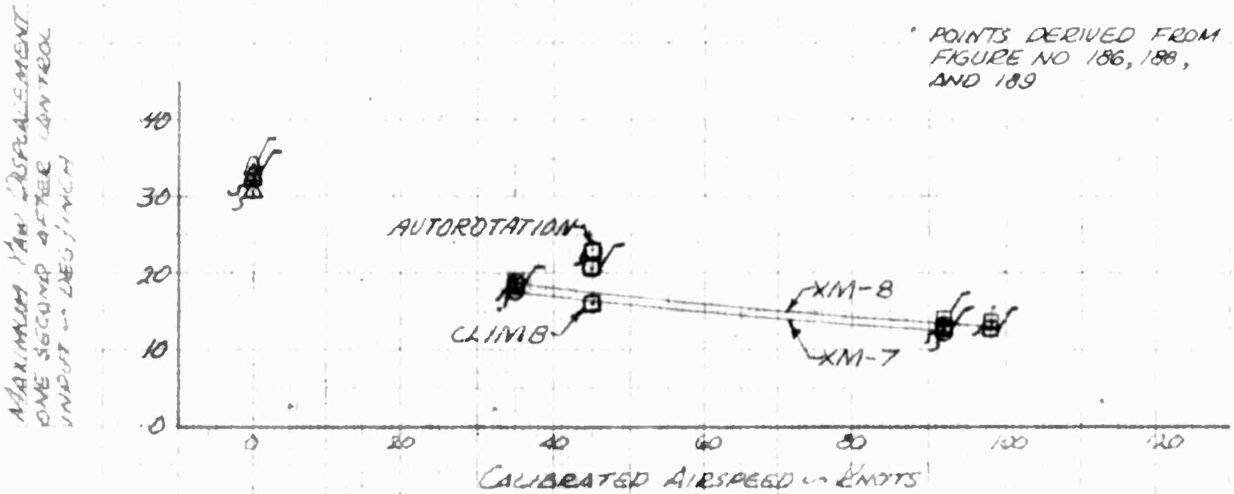


FIGURE NO. 181
SUMMARY OF ANGULAR YAW DISPLACEMENT
OH-4A USA S/N 62-4204

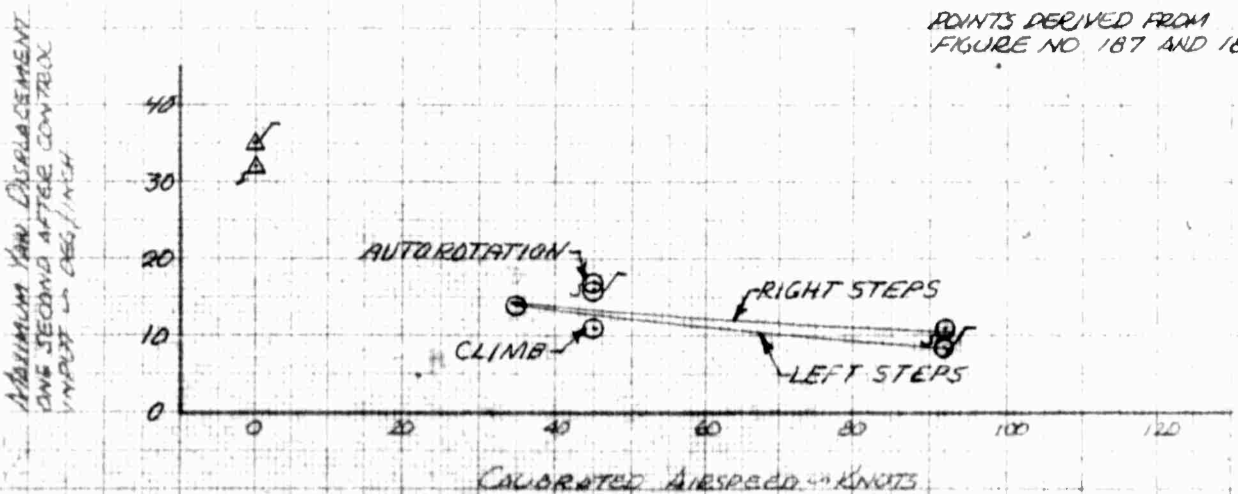
SYM	AVG H_D ~ FT	AVG G.W. ~ LB	AVG CG ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
△ (flag)	2050	2660	105.00	1.25LT	394	XM-7 SAE OFF	HOVER (IGE)
△	1740	2640	105.40	1.30LT	394	XM-8 SAE OFF	HOVER (IGE)
○	4950	2600	104.70	1.25LT	394	XM-7 SAE OFF	LEVEL FLIGHT AND NOTED
□	4830	2540	105.00 (AFT)	1.30LT	394	XM-8 SAE OFF	LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH LEFT AND RIGHT STEPS
SYMBOLS WITH FLAGS DENOTE LEFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE RIGHT STEPS ONLY



SYM	AVG H_D ~ FT	AVG G.W. ~ LB	AVG CG ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
△	2050	2570	104.55	1.25LT	394	XM-7	SAE ON HOVER (IGE)
○	4820	2570	104.50 (AFT)	1.25LT	394	XM-7	SAE ON LEVEL FLIGHT AND NOTED

OPEN SYMBOLS DENOTE BOTH LEFT AND RIGHT STEPS
SYMBOLS WITH FLAGS DENOTE LEFT STEPS ONLY
SYMBOLS WITH TAILS DENOTE RIGHT STEPS ONLY



FOR OFFICAL USE ONLY

FIGURE NO. 182

ANGULAR YAW DISPLACEMENT

OH-4A USA S/N 62-4204

SAE OFF

SYM	AIRSPEED ~KCAS	AVG H_p ~FT	AVG. G.W ~LB	AVG CG ~ IN LONG	AVG CG ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT. COND.
○	ZERO	1070	2490	105.05	.35 RT	394	CLEAN	HOVER (IGE)
□	35 KTS	4525	2560	105.40	.35 RT	394	CLEAN	LEVEL FLIGHT
△	92 KTS	4840	2525	105.20	.35 RT	394	CLEAN	LEVEL FLIGHT
△	99.5 KTS	4645	2505	105.40 (AFT)	.35 RT	394	CLEAN	LEVEL FLIGHT

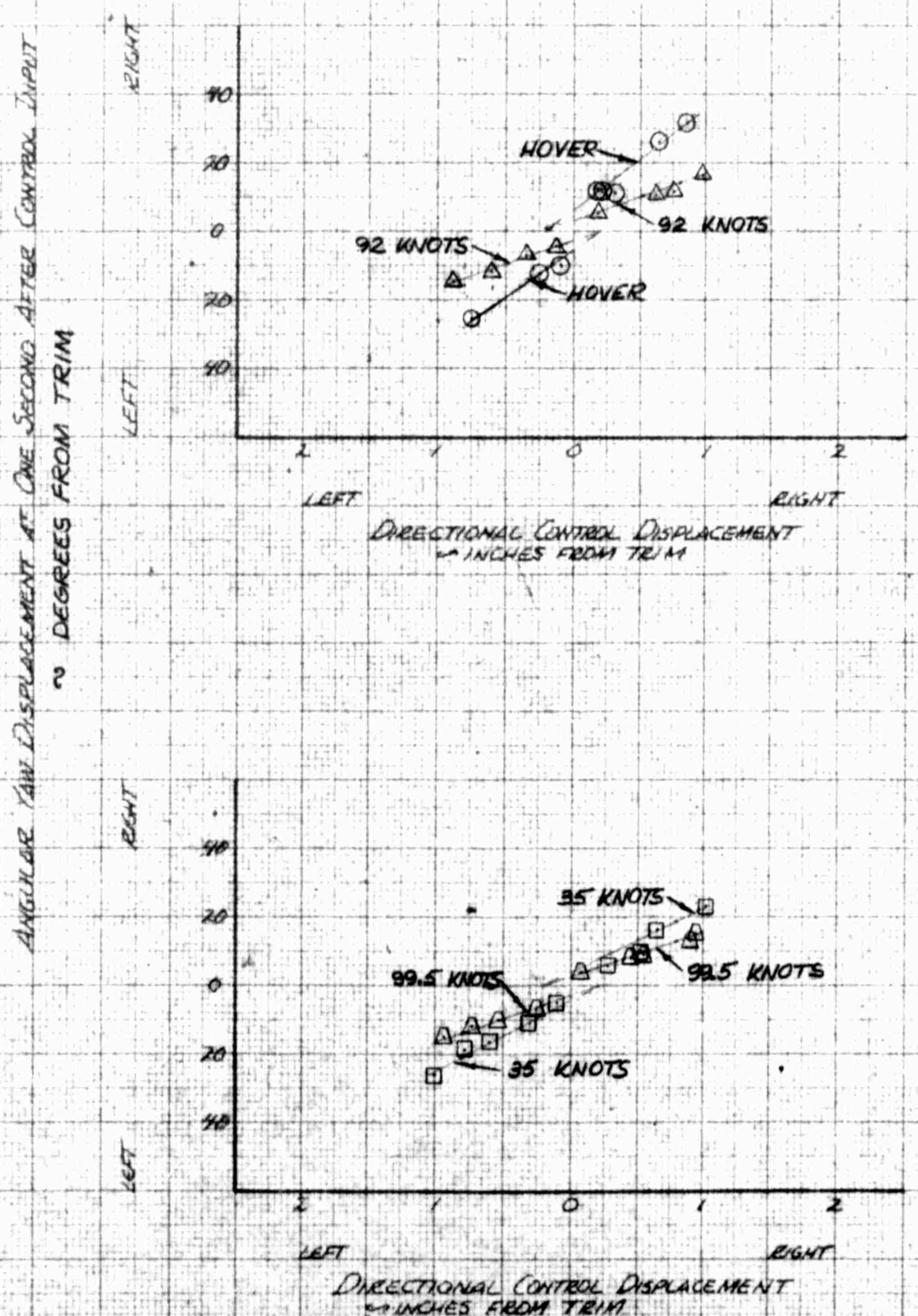


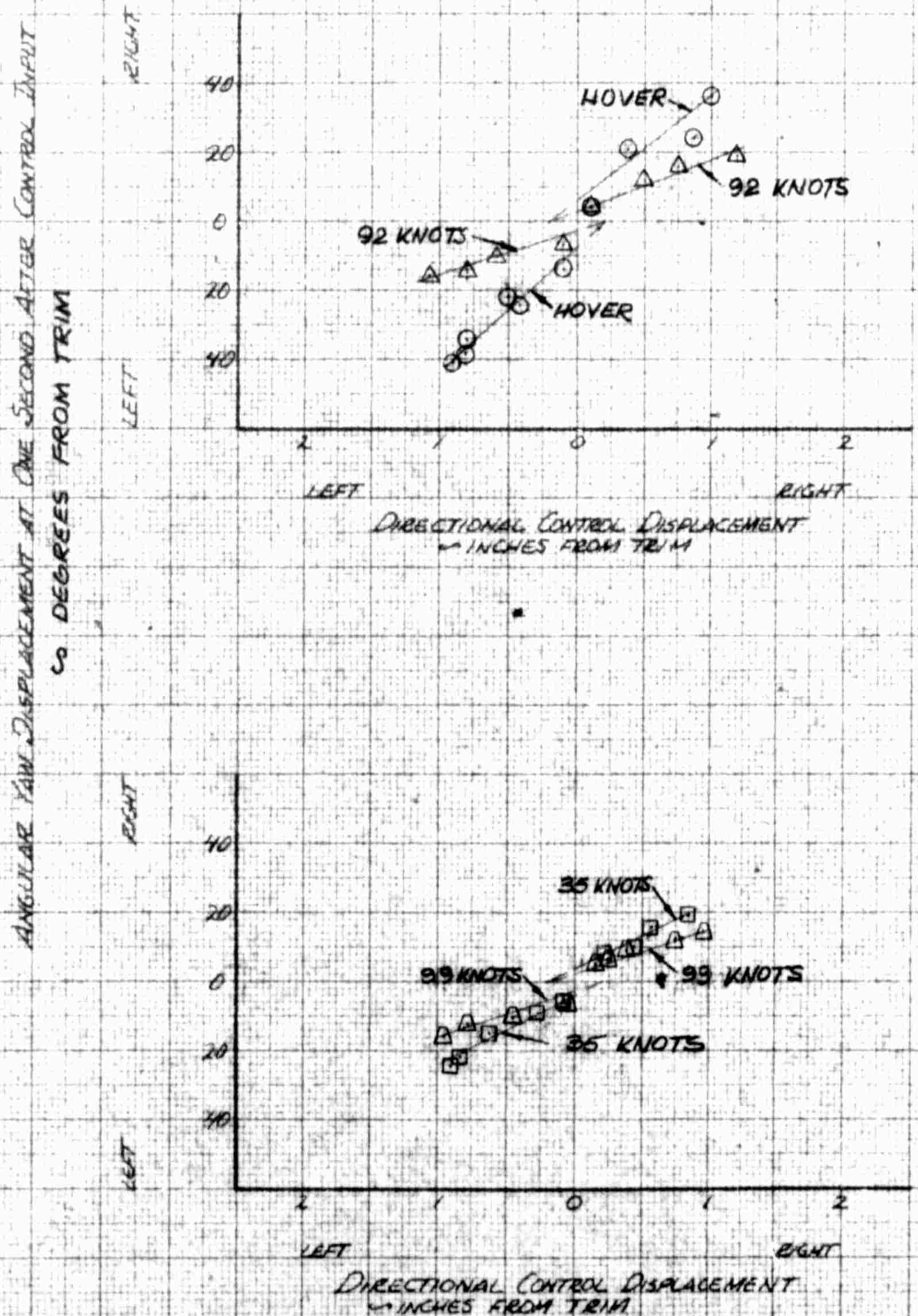
FIGURE No. 183

ANGULAR YAW DISPLACEMENT

OH-4A USA S/N 62-4204

SAE OFF

SYM	AIRSPEED ~KCAS	AVG H_p ~FT	AVG. G.W ~LB	AVG CG ~ IN LONG	AVG CG ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT. COND.
○	ZERO	1480	2960	105.30	.75 LT	394	CLEAN	HOVER (IGE)
□	35 KTS	4560	2870	104.80	.75 LT	394	CLEAN	LEVEL FLIGHT
△	92 KTS	4780	2845	104.70	.75 LT	394	CLEAN	LEVEL FLIGHT
△	99 KTS	4820	2825	104.60 (AFT)	.75 LT	394	CLEAN	LEVEL FLIGHT



FOR OFFICAL USE ONLY

FIGURE No. 184

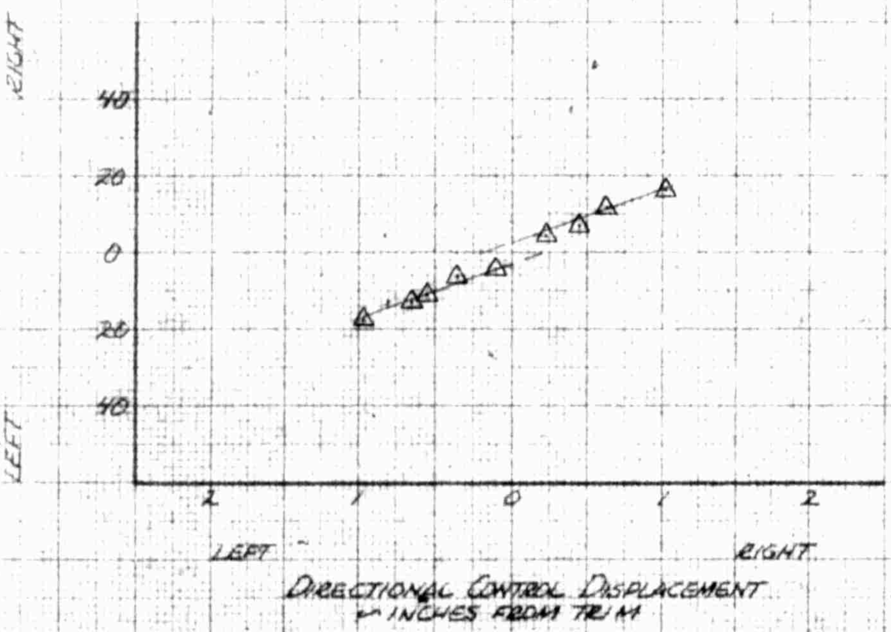
ANGULAR YAW DISPLACEMENT

OH-4A USA S/N 62-4204

SAE OFF

SYM	AIRSPEED ~CAS	AVG Hp ~FT	AVG. G.W. ~LB	AVG CG ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT. COND.
□	35 KTS	9475	2550	105.35	.35 RT	394	CLEAN	LEVEL FLIGHT
△	76 KTS	9470	2525	105.20	.35 RT	394	CLEAN	LEVEL FLIGHT
△ (flagged)	92 KTS	9500	2510	105.10 (AFT)	.35 RT	394	CLEAN	LEVEL FLIGHT

ANGULAR YAW DISPLACEMENT AT ONE SECOND AFTER CONTROL INPUT ~ DEGREES FROM TRIM



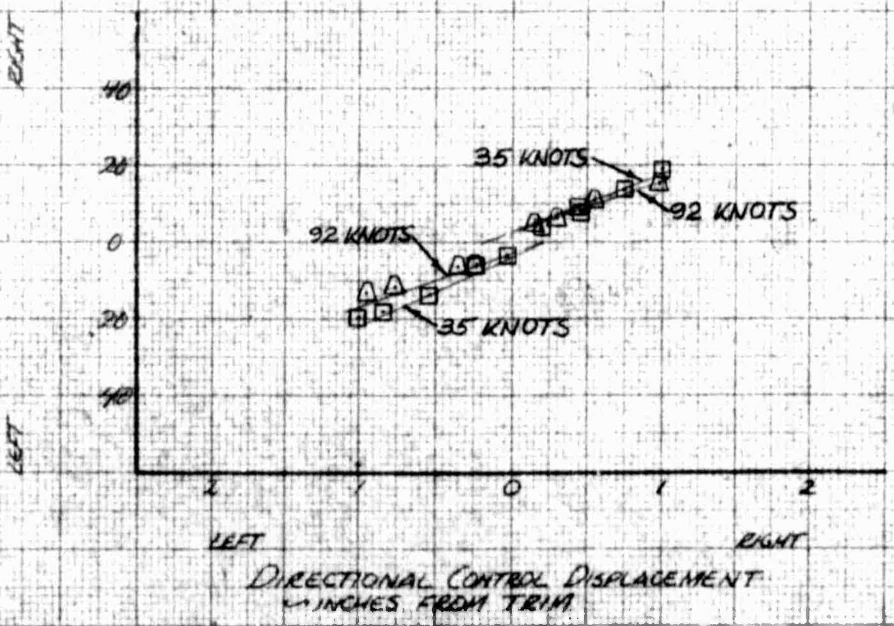


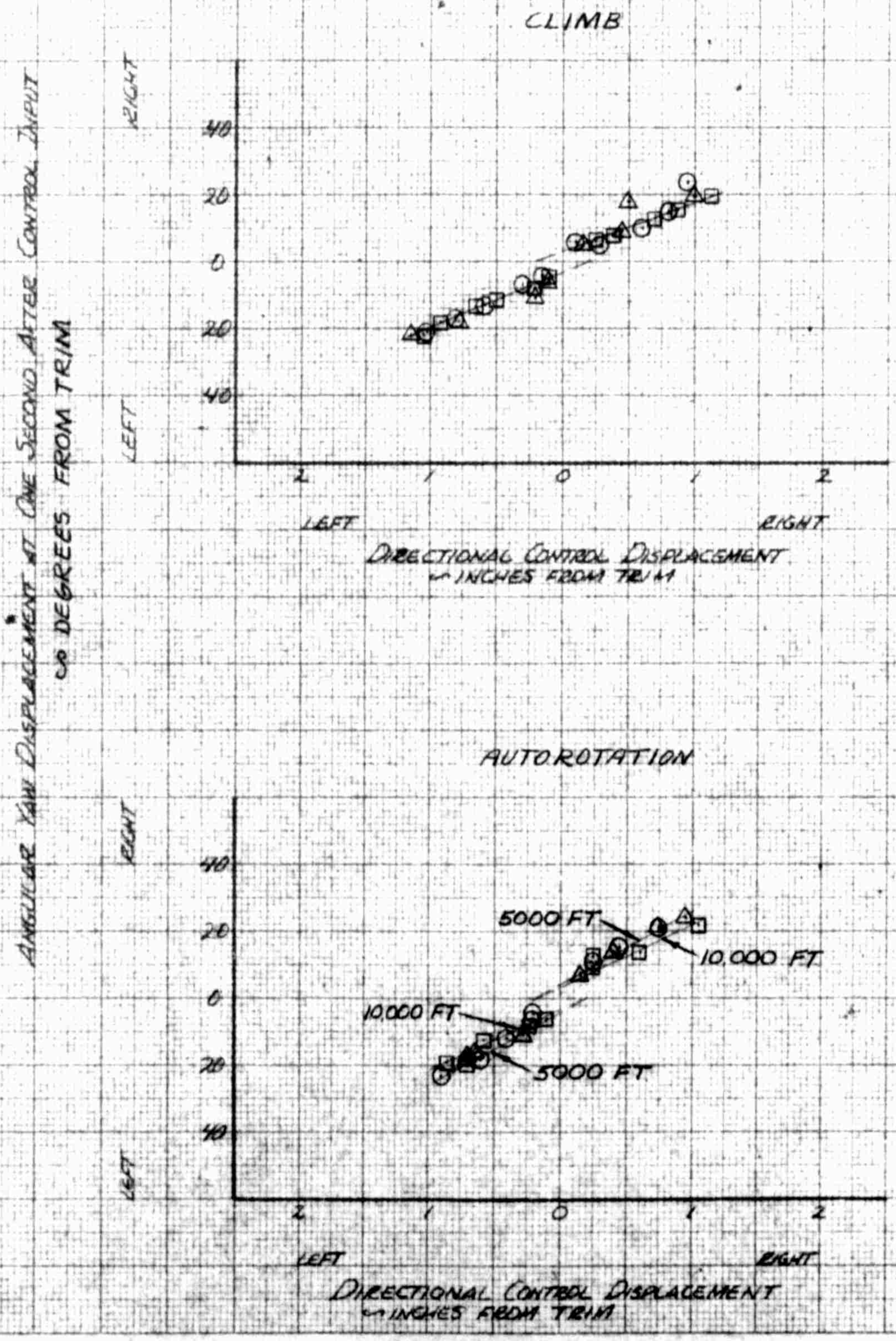
FIGURE No. 185

ANGULAR YAW DISPLACEMENT

OH-4A USA S/N 62-4204

SAE OFF

SYM	AIRSPEED ~CAS	AVG H_p ~FT	AVG. G.W. ~LB	AVG CG ~ IN LONG	AVG CG ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT. COND.
○	45 KTS	5000	2615	105.70	.35 RT	394	CLEAN	NOTED
□	45 KTS	10,000	2605	105.60	.35 RT	394	CLEAN	NOTED
△	45 KTS	5000	2905	105.00 (AFT)	.75 RT	394	CLEAN	NOTED



FOR OFFICAL USE ONLY

legible reproduction

FIGURE NO 186

ANGULAR YAW DISPLACEMENT

OH-6A USA S/N 62-4204

SAE OFF

SYM	AIRSPEED ~CAS	AVG H_D ~FT	AVG GW ~LB	AVG CG ~ IN LONG	AVG CG ~ IN LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	2050	2660	105.00	1.25 LT	394	XM-7	HOVER (IGE)
□	35 KTS	4900	2550	104.50	1.25 LT	394	XM-7	LEVEL FLIGHT
△	92 KTS	4890	2485	104.40 (AFT)	1.25 LT	394	XM-7	LEVEL FLIGHT

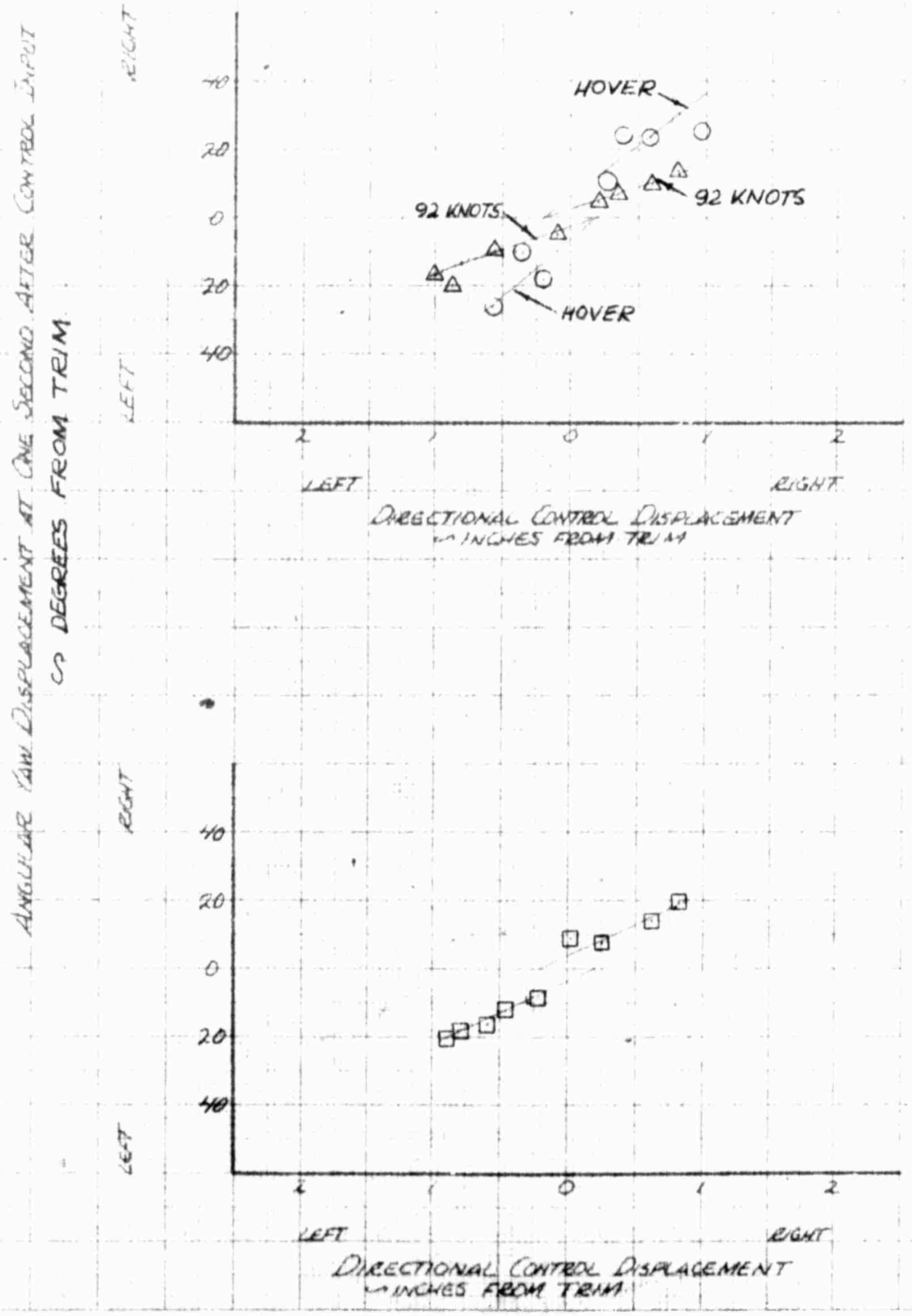


FIGURE NO. 187

ANGULAR YAW DISPLACEMENT

OH-4A USA S/N 62-4204

SAE ON

SYM	AIRSPEED ~CAS	AVG H_p ~FT	AVG. G.W. ~LB	AVG CG ~ IN LONG	LAT	ROTOR RPM	CONFIGURATION	FLT COND
○	ZERO	2050	2570	104.55	1.25 LT	394	XM-7	HOVER (IGE)
□	35 KTS	4695	2570	104.55	1.25 LT	394	XM-7	LEVEL FLIGHT
△	92 KTS	4610	2510	104.40 (AFT)	1.25 LT	394	XM-7	LEVEL FLIGHT

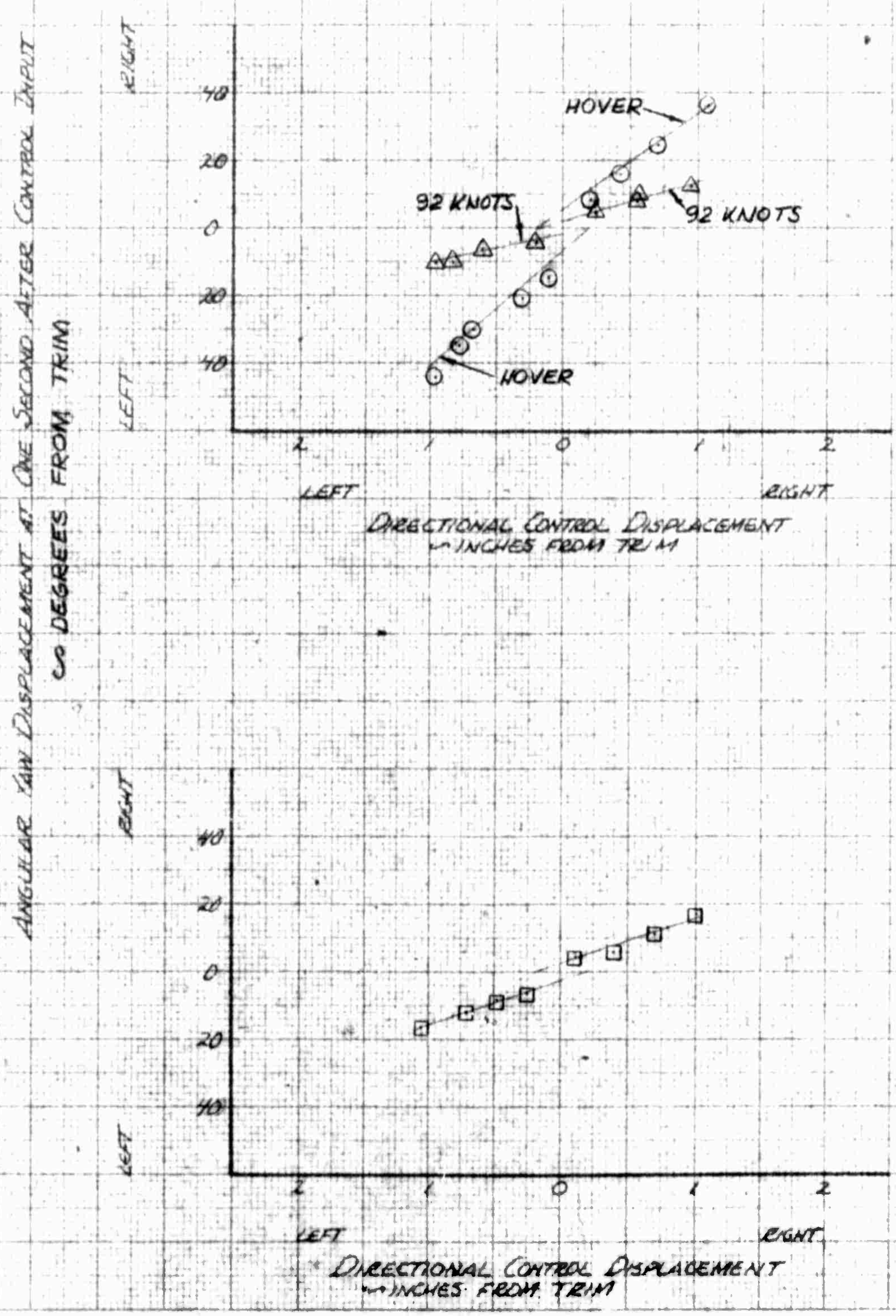


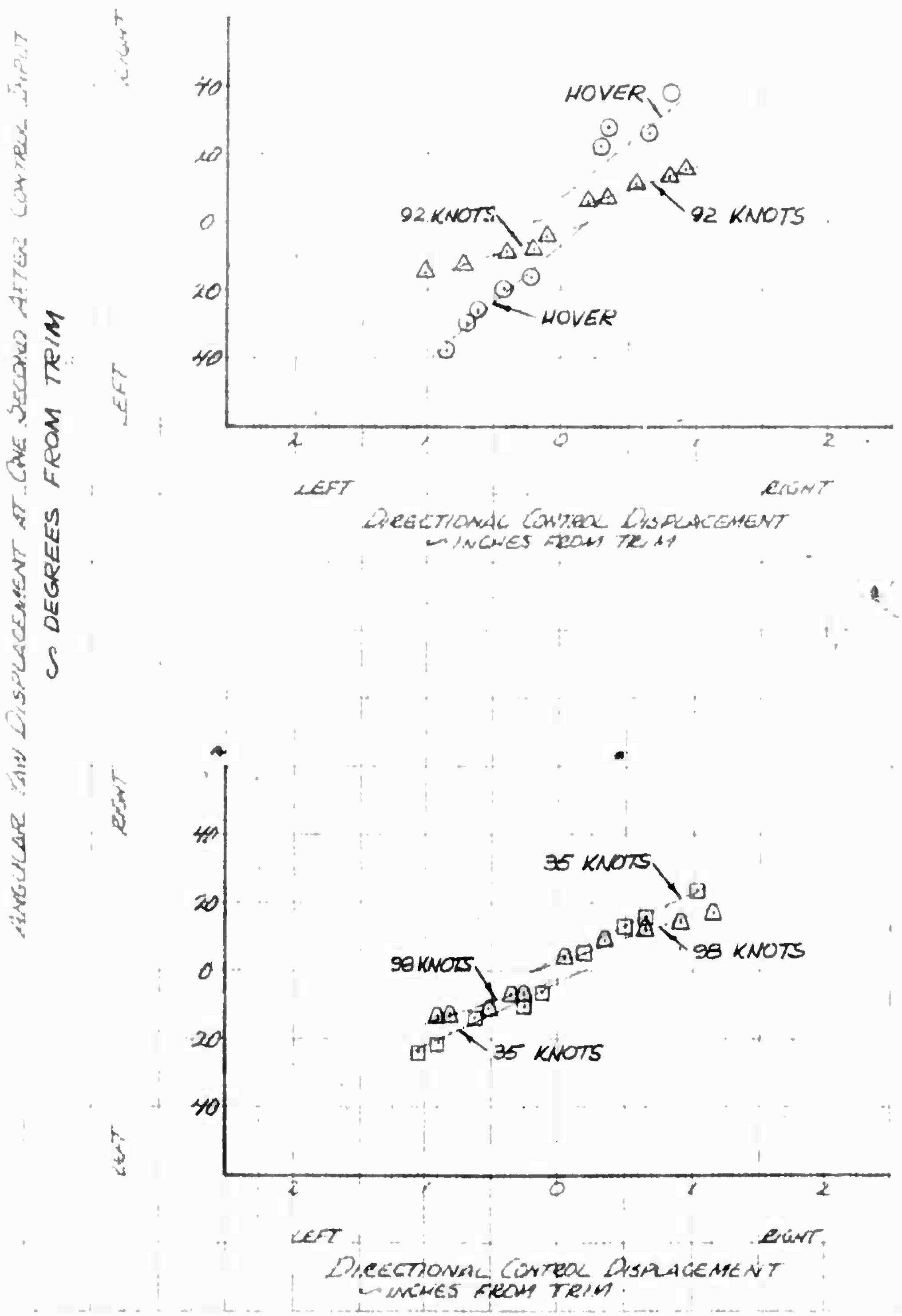
FIGURE No 188

ANGULAR YAW DISPLACEMENT

OH-4A USA S/N 62 4204

SAE OFF

SYM	AIRSPEED ~KCAS	AVG H_P ~FT	AVG GW ~LB	AVG CG ~ IN LONG	AVG CG ~ IN LAT	ROTOR ~RPM	CONFIGURATION	[illegible]
○	ZERO	1740	2640	105.40	1.30 LT	394	XM-8	HOVER (IGE)
□	35 KTS	4710	2540	105.00	1.30 LT	394	XM-8	LEVEL FLIGHT
△	92 KTS	4770	2520	105.00	1.30 LT	394	XM-8	LEVEL FLIGHT
△	98 KTS	4670	2480	104.90 (AFT)	1.30 LT	394	XM-8	LEVEL FLIGHT



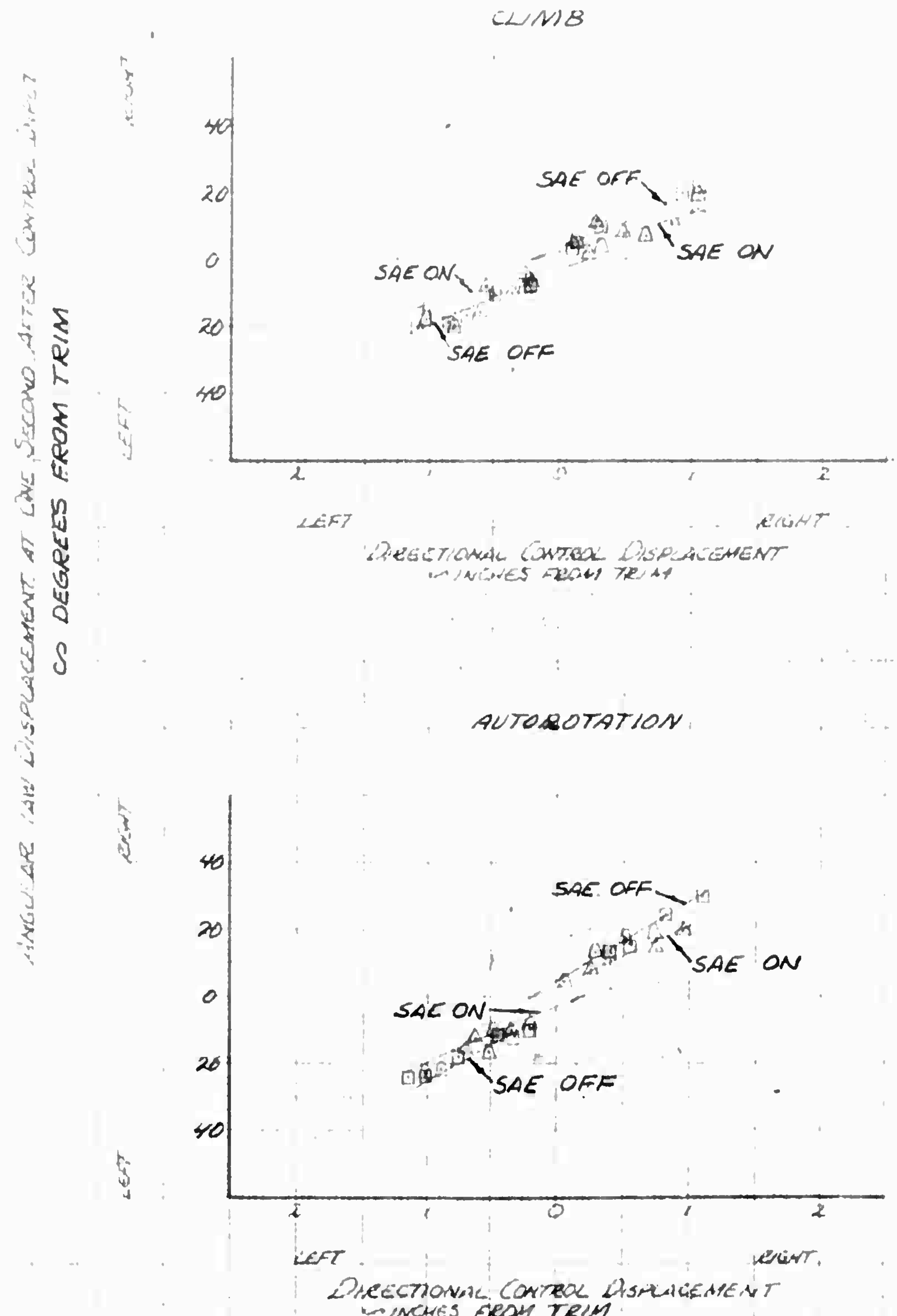
FOR OFFICAL USE ONLY

FIGURE NO 189

ANGULAR YAW DISPLACEMENT

OH 4A USA S/N 62 4204

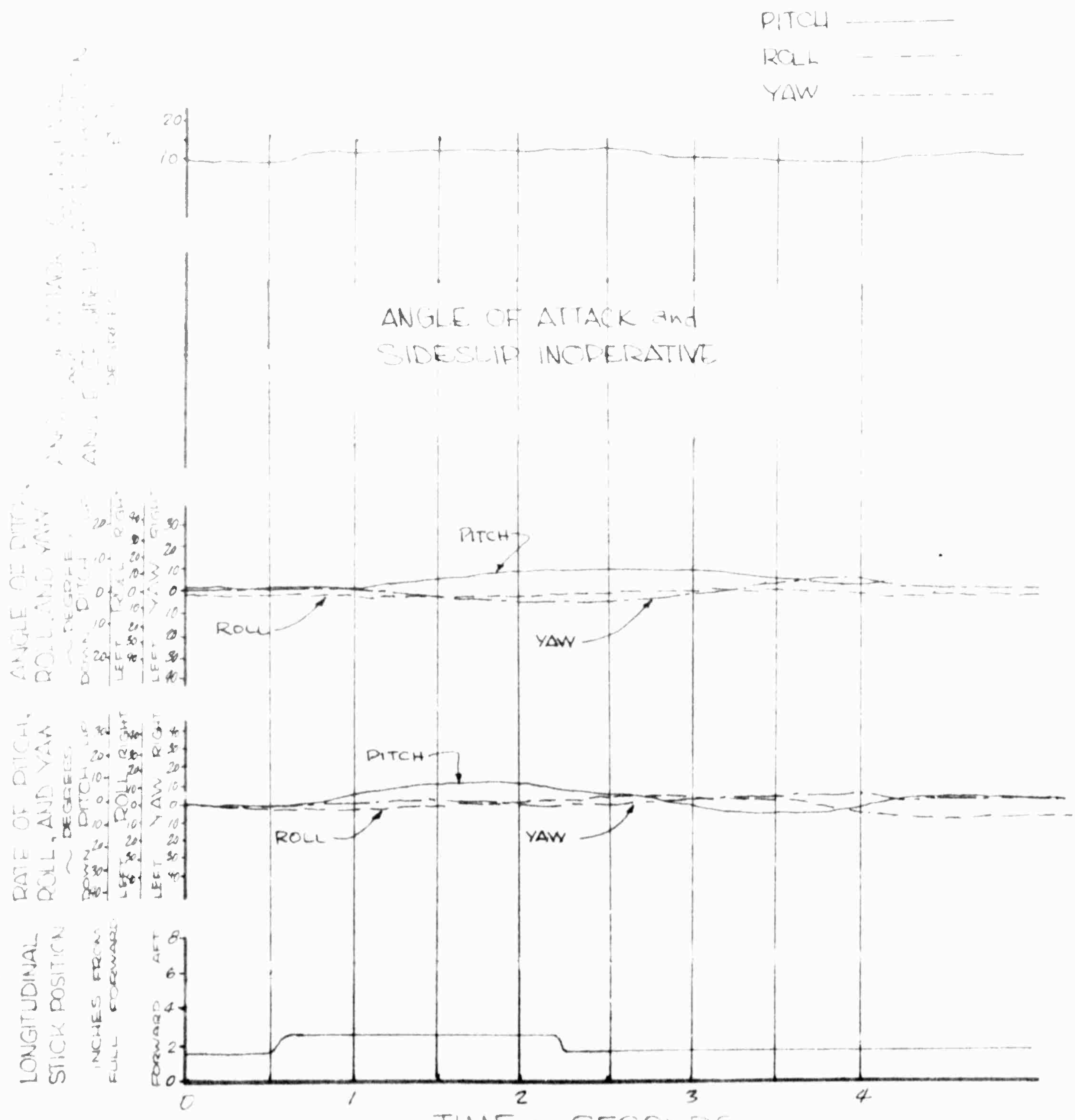
SYM	AIRSPEED KCAS	AVG H_D FT	AVG GW LB	AVG CG IN LONG	LAT	ROTOR RPM	CONFIGURATION		FLT COND
□	45 KTS	5000	2575	105.10	1.30 LT	394	XM-8	SAE-OFF	NOTED
△	45 KTS	5000	2600	104.70	1.25 LT	394	XM-7	SAE ON	NOTED
△	45 KTS	5000	2660	105.00	1.25 LT	394	XM-7	SAE-OFF	NOTED



AFT LONGITUDINAL STEP

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-8 STOWED	FLIGHT CONDITION: LEVEL FLIGHT
FULL LONGITUDINAL TRAVEL: 8.2 INCHES	TRIM CAS: 92 KNOTS
AVERAGE GROSS WEIGHT: 2580 LBS	DENSITY ALTITUDE: 4630 FEET
LONG. C.G. LOCATION: 104.85 IN. (AFT)	ROTOR SPEED: 394 RPM
LATERAL C.G. LOCATION: 1.30 IN. (LT.)	SAE CONDITION: OFF

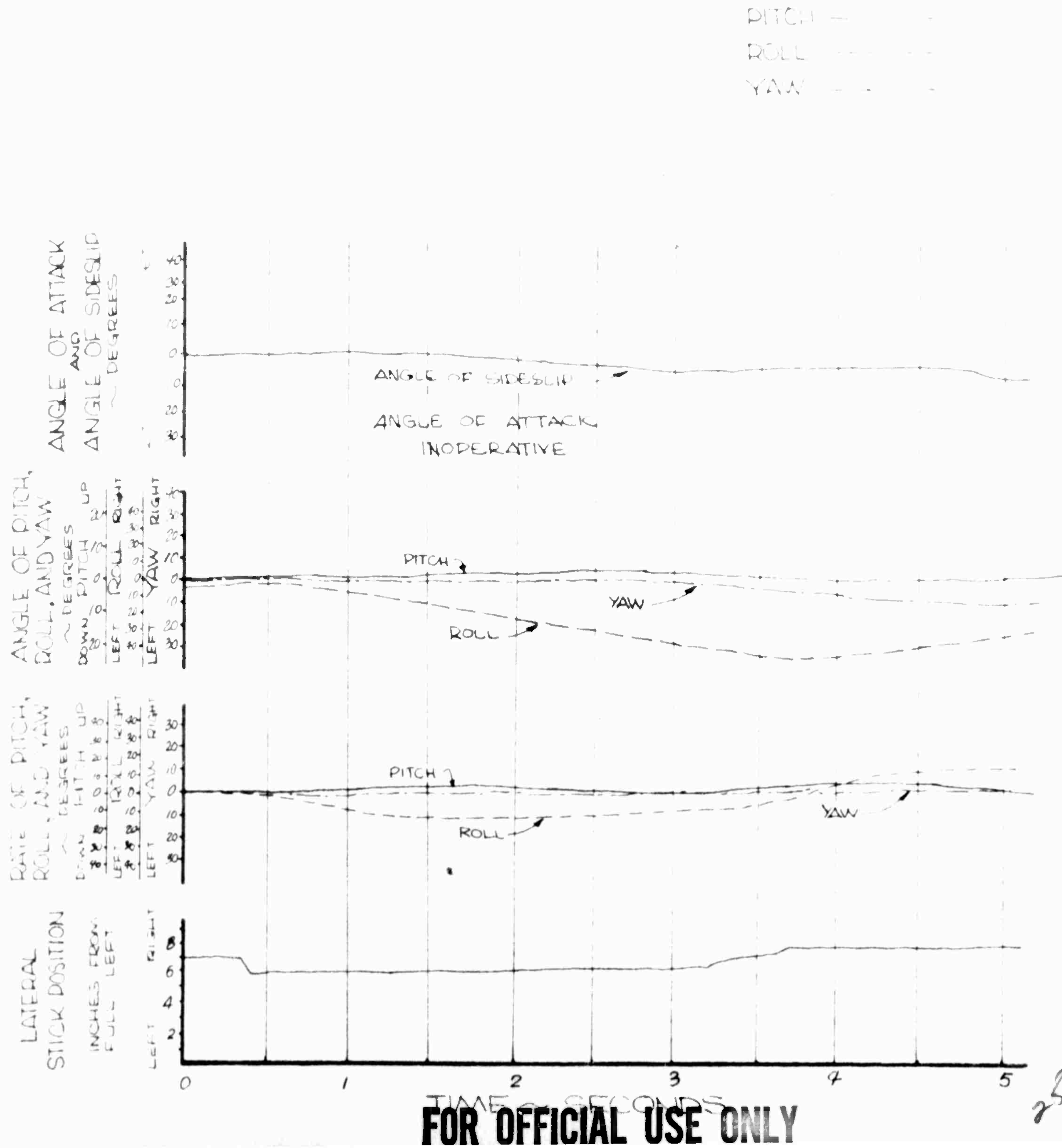


LEFT LATERAL STEP

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-8 STOWED
FULL LATERAL TRAVEL: 9.5 INCHES
AVERAGE GROSS WEIGHT: 2530 LBS
LONG. C.G. LOCATION: 105.00 IN (AFT)
LATERAL C.G. LOCATION: 1.30 IN (LT)

FLIGHT CONDITION: LEVEL FLIGHT
TRIM CAS: 92 KNOTS
DENSITY ALTITUDE: 4770 FEET
ROTOR SPEED: 394 RPM
SAE CONDITION: OFF



FOR OFFICIAL USE ONLY

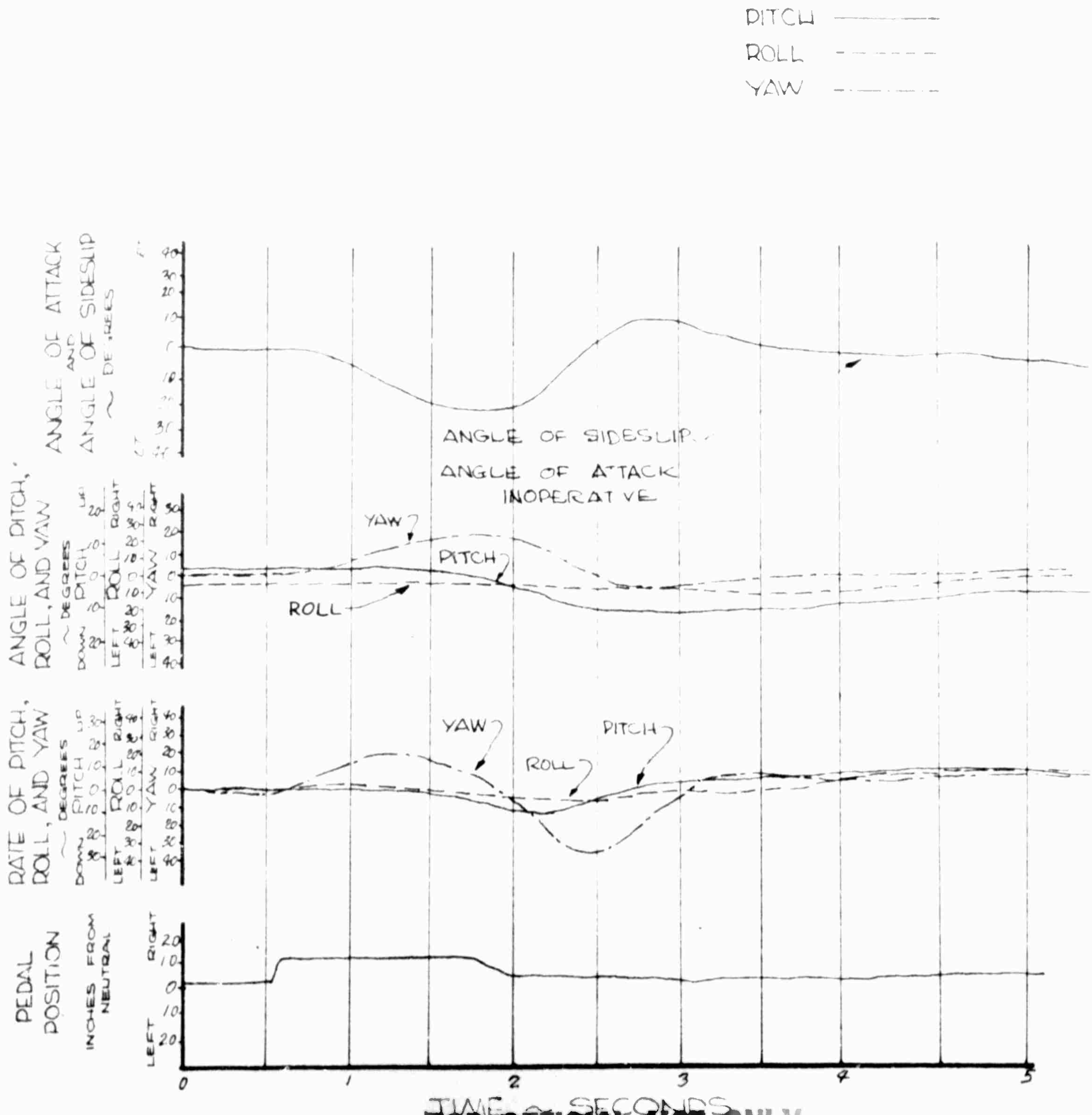
FIGURE NO. 192

RIGHT DIRECTIONAL STEP

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-8 STOWED
FULL PEDAL TRAVEL: ± 2.6 INCHES
AVERAGE GROSS WEIGHT: 2540 LBS
LONG. C.G. LOCATION: 105.00 IN. (AFT)
LATERAL C.G. LOCATION: 1.30 IN. (LT.)

FLIGHT CONDITION: LEVEL FLIGHT
TRIM CAS: 92 KNOTS
DENSITY ALTITUDE: 4620 FEET
ROTOR SPEED: 394 RPM
SAE CONDITION: OFF



FOR OFFICIAL USE ONLY

FIGURE NO. 193

TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

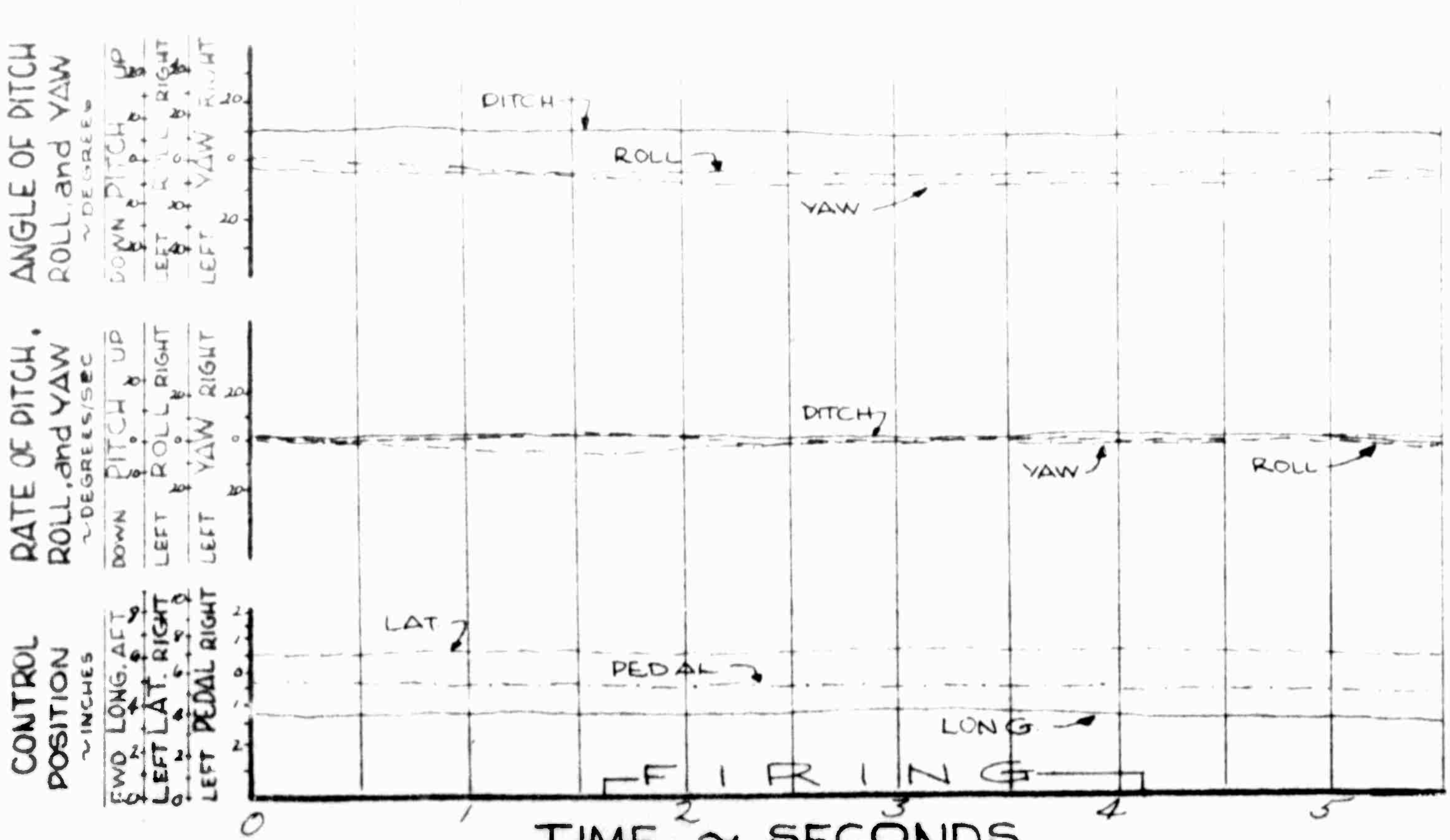
(IN GROUND EFFECT)

CONFIGURATION: XM-7 (3.5° UP)
AVERAGE GROSS WEIGHT: 2520 LBS
LONG C.G. LOCATION: 104.95 IN (AFT)
LATERAL C.G. LOCATION: 1.20 IN (LT)

FLIGHT CONDITION: HOVER (SAE-OFF)
TRIM CAS: ZERO
DENSITY ALTITUDE: 4330 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG STICK
ROLL - - - - and LAT STICK
YAW — - — - and PEDAL

(CONTROLS FIXED)



FOR OFFICAL USE ONLY

FIGURE NO. 194

TIME HISTORY OF ARMAMENT FIRING

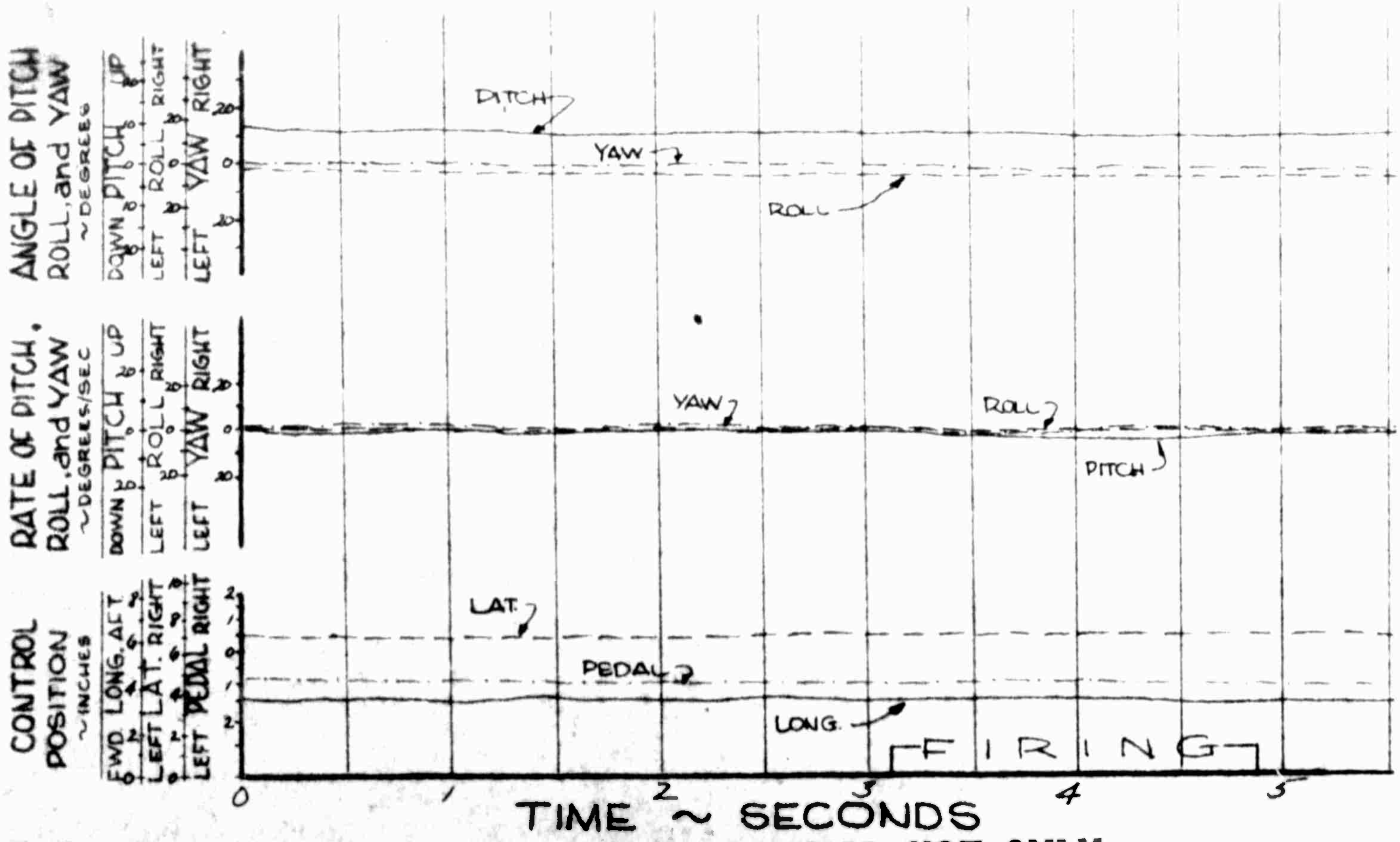
OH-4A, U.S.A., S/N 62-4204

(IN GROUND EFFECT)

CONFIGURATION: XM-7 (3.5° UP)
AVERAGE GROSS WEIGHT: 2523 LBS.
LONG. C.G LOCATION: 104.95 IN (AFT)
LATERAL C.G. LOCATION: 1.20 IN (LT.)

FLIGHT CONDITION: HOVER (SAE-ON)
TRIM CAS: ZERO
DENSITY ALTITUDE: 4330 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG. STICK
ROLL - - - - and LAT. STICK (CONTROLS FIXED)
YAW — - — - — and PEDAL



FOR OFFICIAL USE ONLY

FIGURE NO. 195

TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

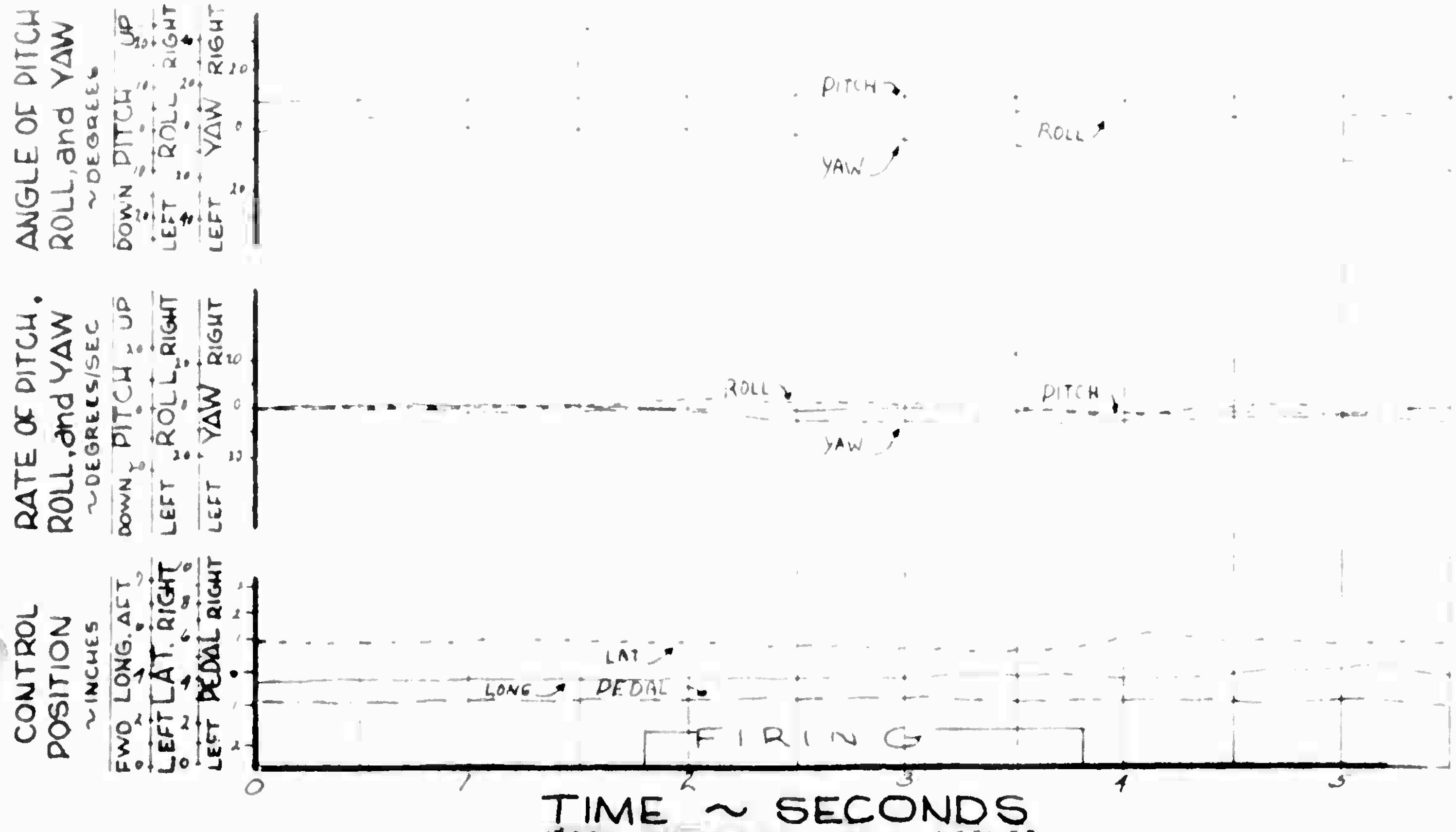
IN GROUND EFFECT

CONFIGURATION: XM-7 (35° DOWN)
AVERAGE GROSS WEIGHT: 2510 LBS.
LONG C.G LOCATION: 104.95 IN. (AFT)
LATERAL C.G LOCATION: 1.15 IN. (LT.)

FLIGHT CONDITION: HOVER (SAE OFF)
TRIM CAS: ZERO
DENSITY ALTITUDE: 4330 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG STICK
ROLL - - - - and LAT STICK
YAW — - — - and PEDAL

(CONTROLS FIXED)



FOR OFFICAL USE ONLY

FIGURE NO 196

TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

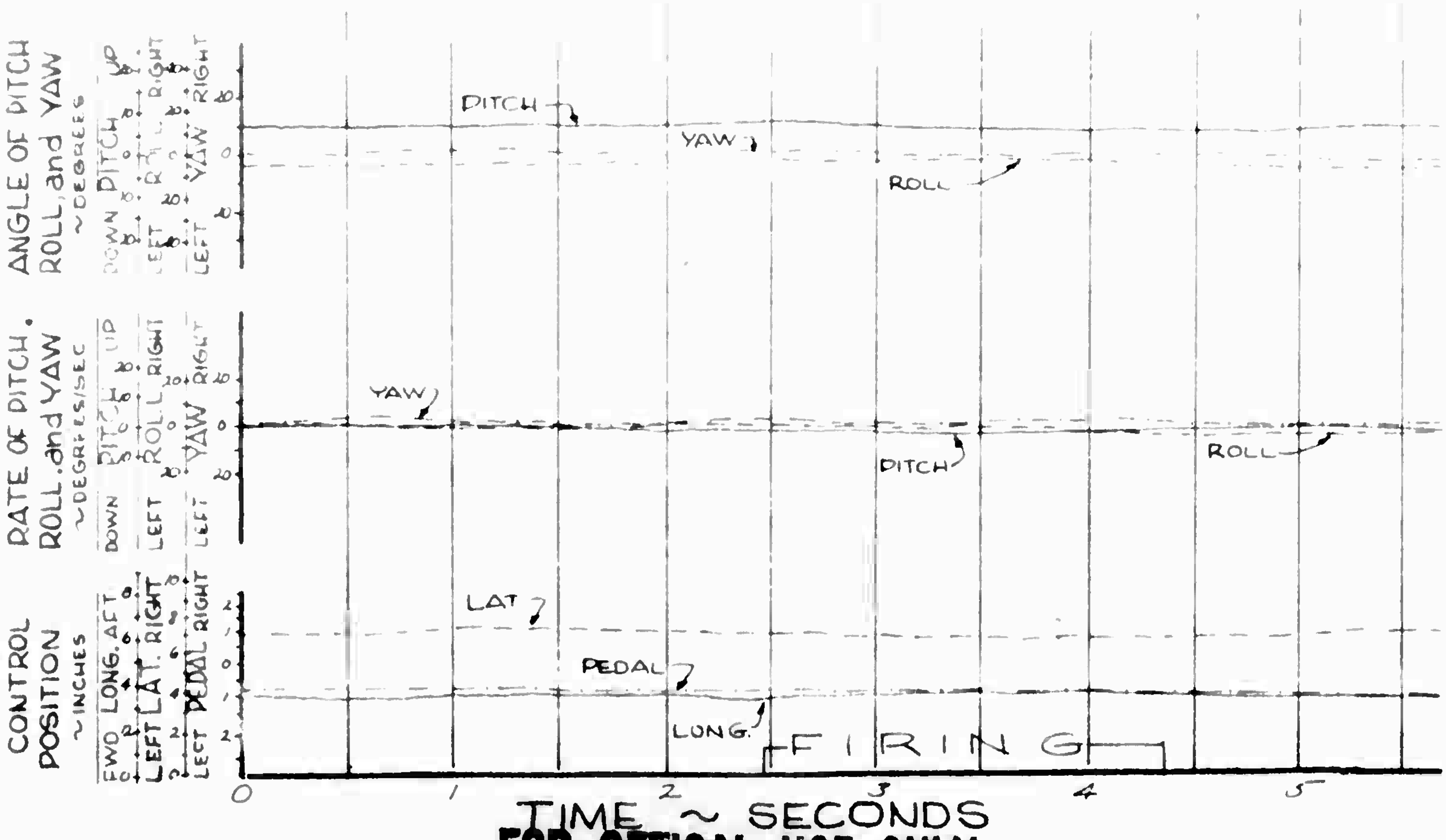
(IN GROUND EFFECT)

CONFIGURATION: XM-7 (35° DOWN)
AVERAGE GROSS WEIGHT: 2515 LBS
LONG CG LOCATION: 104.95 IN (AFT)
LATERAL CG LOCATION: 1.15 IN (LT)

FLIGHT CONDITION: HOVER (SAE-ON)
TRIM CAS: ZERO
DENSITY ALTITUDE: 4330 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG STICK
ROLL – – – – and LAT STICK
YAW — - — - — and PEDAL

(CONTROLS FIXED)



TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

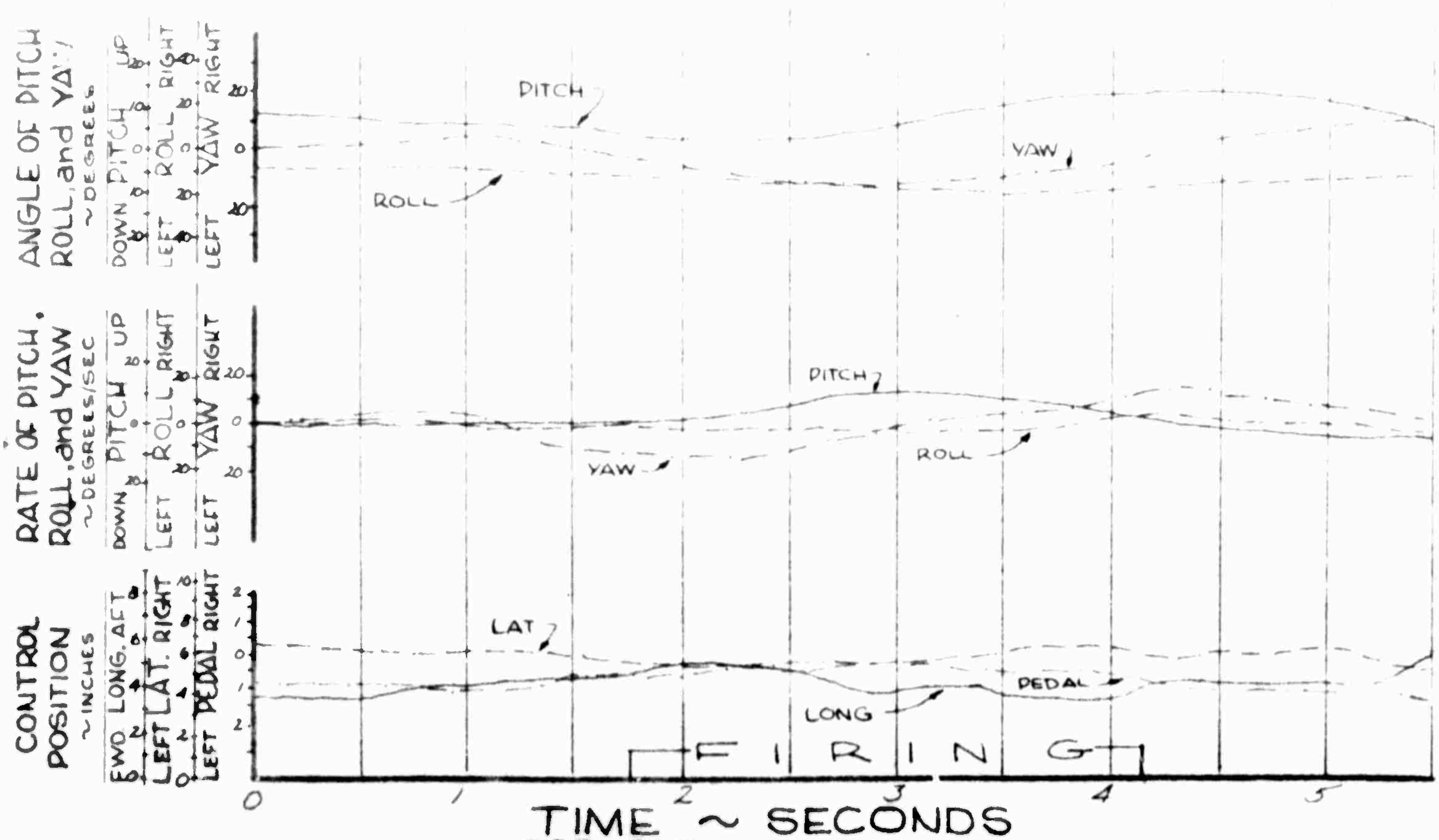
(IN GROUND EFFECT)

CONFIGURATION: XM-7 (3.5° UP)
AVERAGE GROSS WEIGHT: 2530 LBS
LONG CG LOCATION: 105.00 IN (AFT)
LATERAL CG LOCATION: 1.20 IN (LT)

FLIGHT CONDITION: LEFT SIDEWARD (SAE-OFF)
TRIM CAS: APPROX. 12 KNOTS (TRANSLATION)
DENSITY ALTITUDE: 4330 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG STICK
ROLL - - - - and LAT STICK
YAW — - — - — and PEDAL

(PILOT HOLDING CONSTANT ATTITUDE)



FOR OFFICAL USE ONLY

TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

(IN GROUND EFFECT)

CONFIGURATION: XM-7 (3.5° UP) | FLIGHT CONDITION: LEFT SIDEWARD (SAE ON)

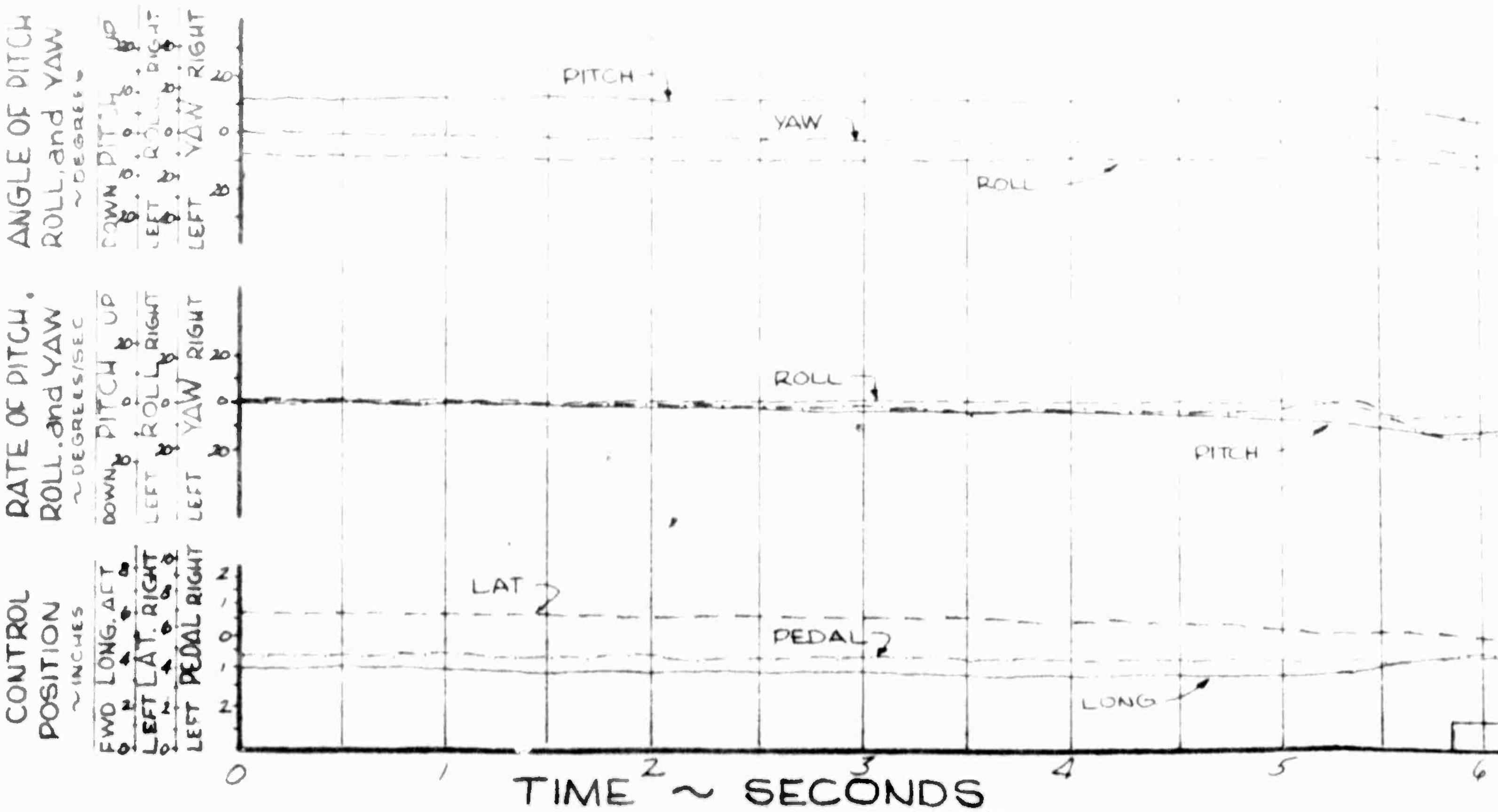
AVERAGE GROSS WEIGHT: 2560 LBS. | TRIM CAS: APPROX. 12 KNOT TRANSLATION)

LONG C.G. LOCATION: 105.05 IN (AFT) | DENSITY ALTITUDE: 4330 FEET

LATERAL C.G. LOCATION: 1.30 IN (LT) | ROTOR SPEED: 394 RPM

PITCH and LONG STICK ——— ROLL and LAT STICK - - - - YAW and PEDAL — - — -

(PILOT HOLDING CONSTANT ATTITUDE)



FOR OFFICIAL USE ONLY

T FIRING

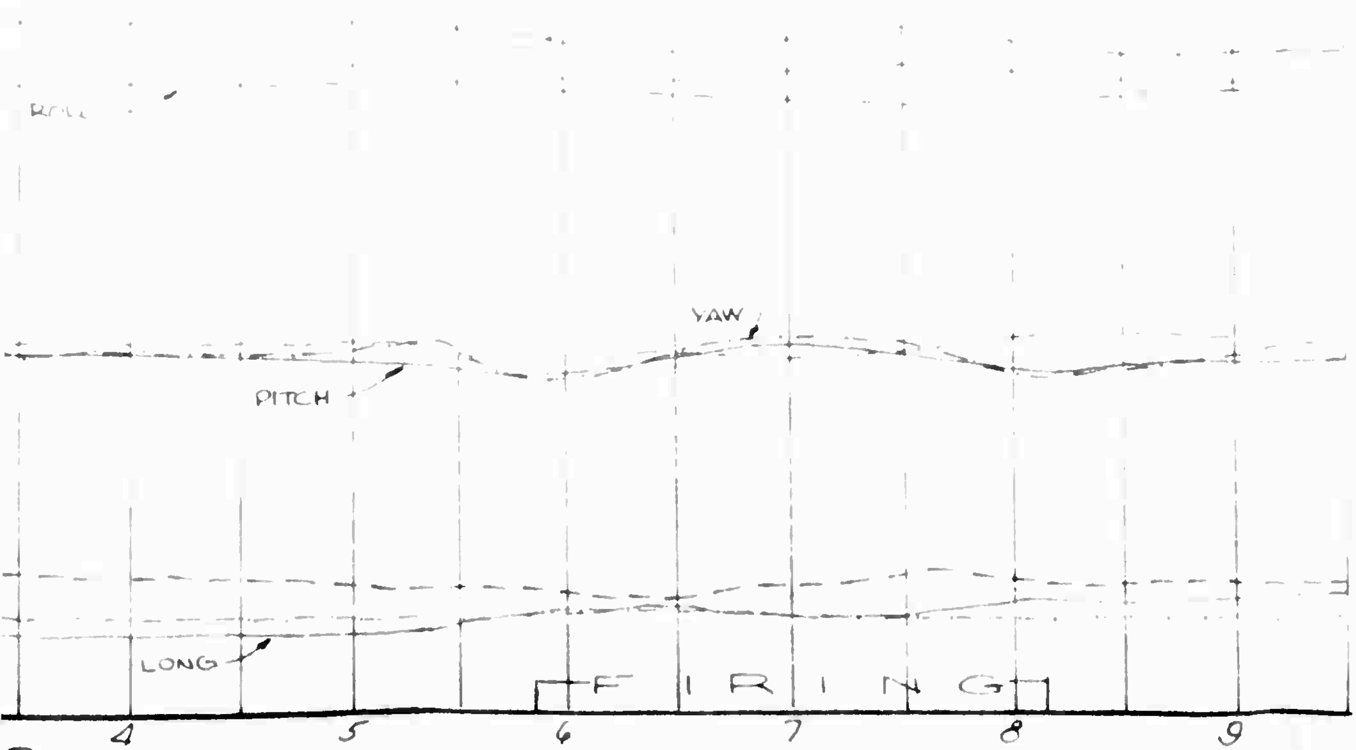
42?4

...DITION: LEFT SIDEWARD(SAE ON...

APPROX. 12 KNOT TRANSLATION

...TITUDE: 43... FEET

...EED: 394 RPM



S

ILY

2

TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

(IN GROUND EFFECT)

CONFIGURATION: XM-7 (35° DOWN) FLIGHT CONDITION: LEFT SIDEWARD (SAS OFF)

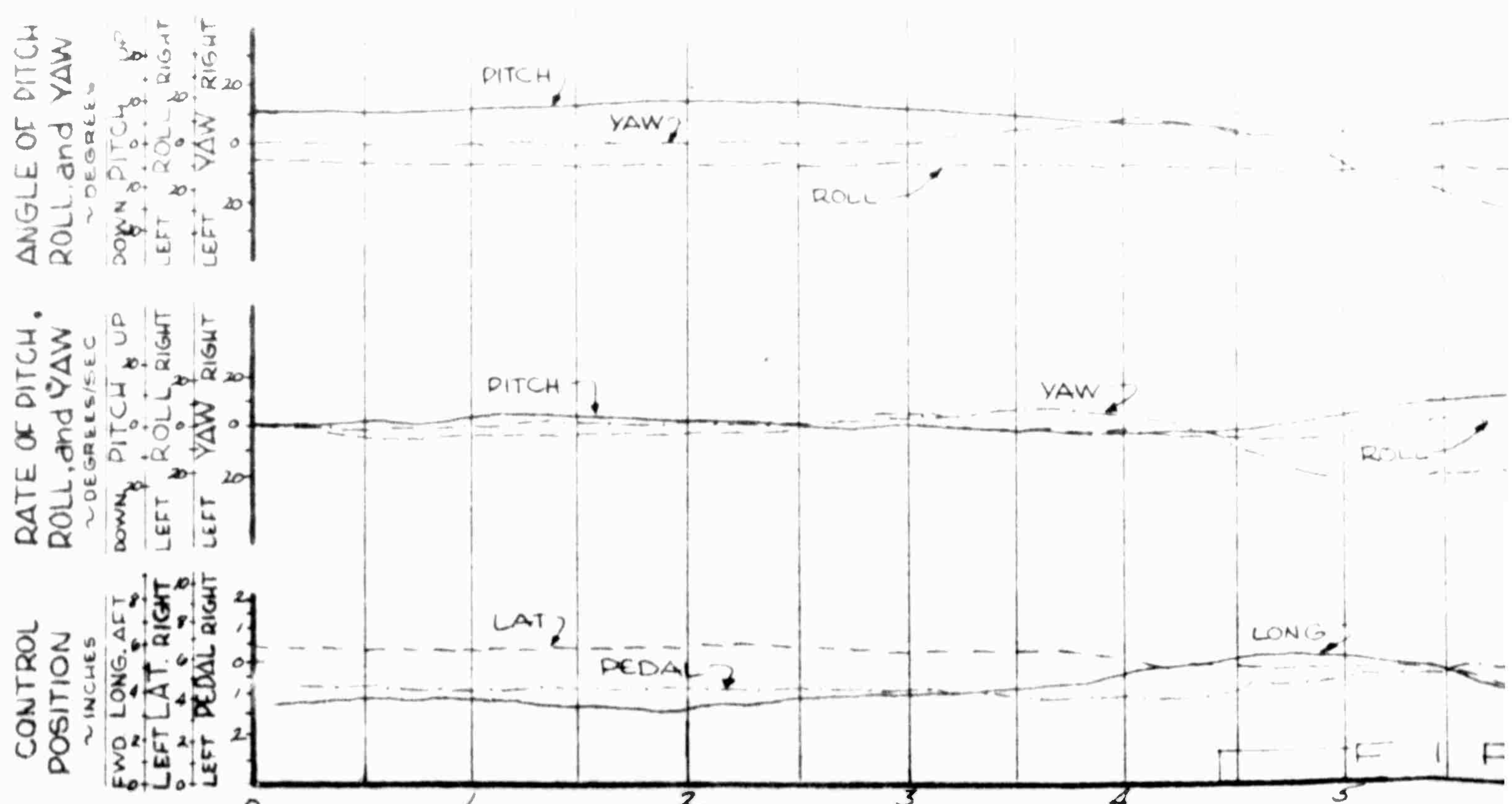
AVERAGE GROSS WEIGHT: 2525 LBS TRIM CAS: APPROX. 12 KNOTS (TR... ATION)

LONG CG LOCATION: 104.95 IN (AFT) DENSITY ALTITUDE: 433... FEET

LATERAL CG LOCATION: 1.20 IN (LT) ROTOR SPEED: 3.. RPM

PITCH ——— and LONG STICK ROLL – – – – and LAT STICK YAW — - — - and PEDAL

(PILOT HOLDING CONSTANT ATTITUDE)



TIME ~ SECONDS

FOR OFFICIAL USE ONLY

MENT FIRING

62-4204

HT CONDITION: LEFT SIDEWARD (SAE-C

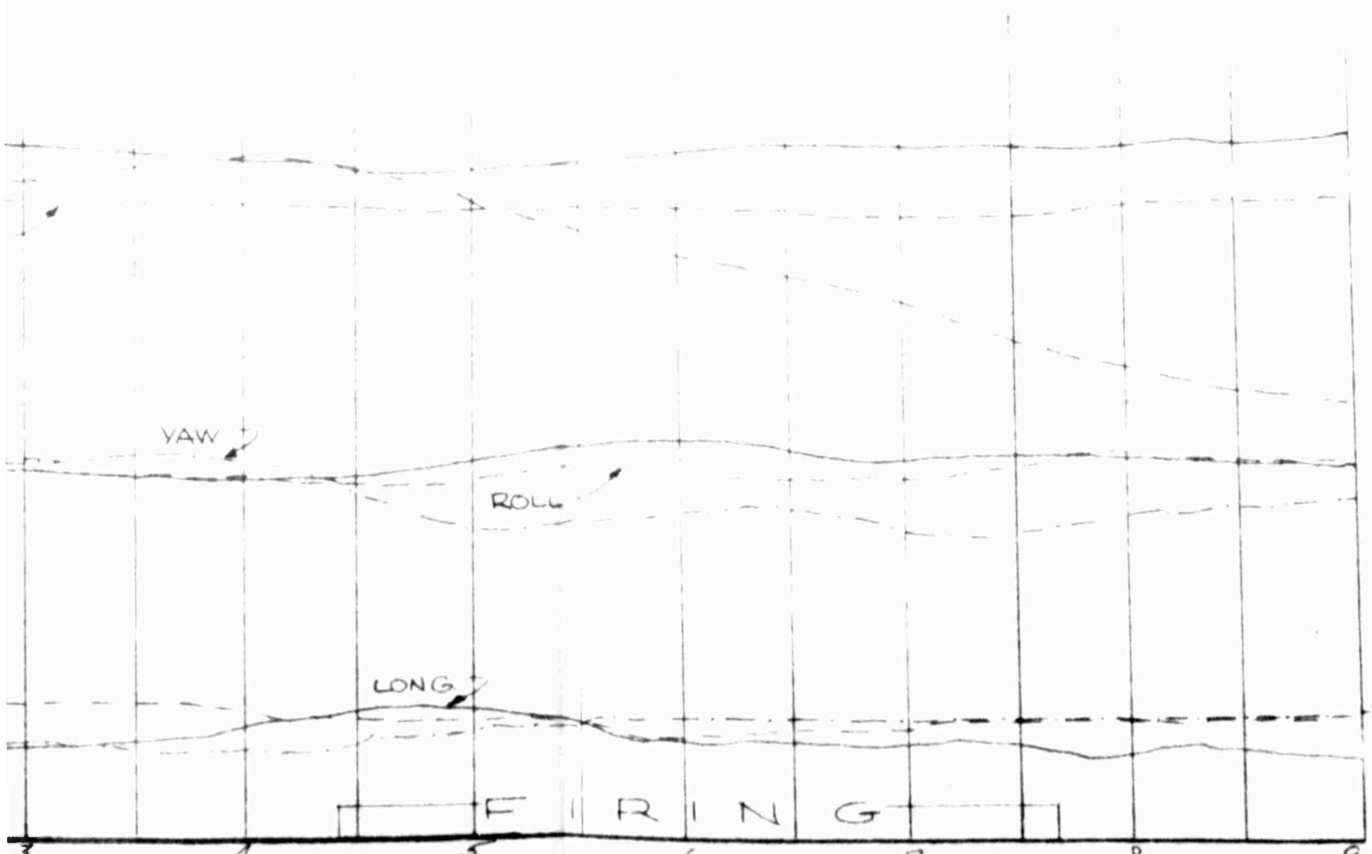
M CAS: APPROX. 12 KNOTS (TRANSLAT

SITY ALTITUDE: 4330 FEET

OR SPEED: RPM

V ————

PEDAL



ONDS

E ONLY

2

TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

(IN GROUND EFFECT)

CONFIGURATION: XM 7 (35° DOWN)
FLIGHT CONDITION: LEFT SIDEWARD (SAE-ON

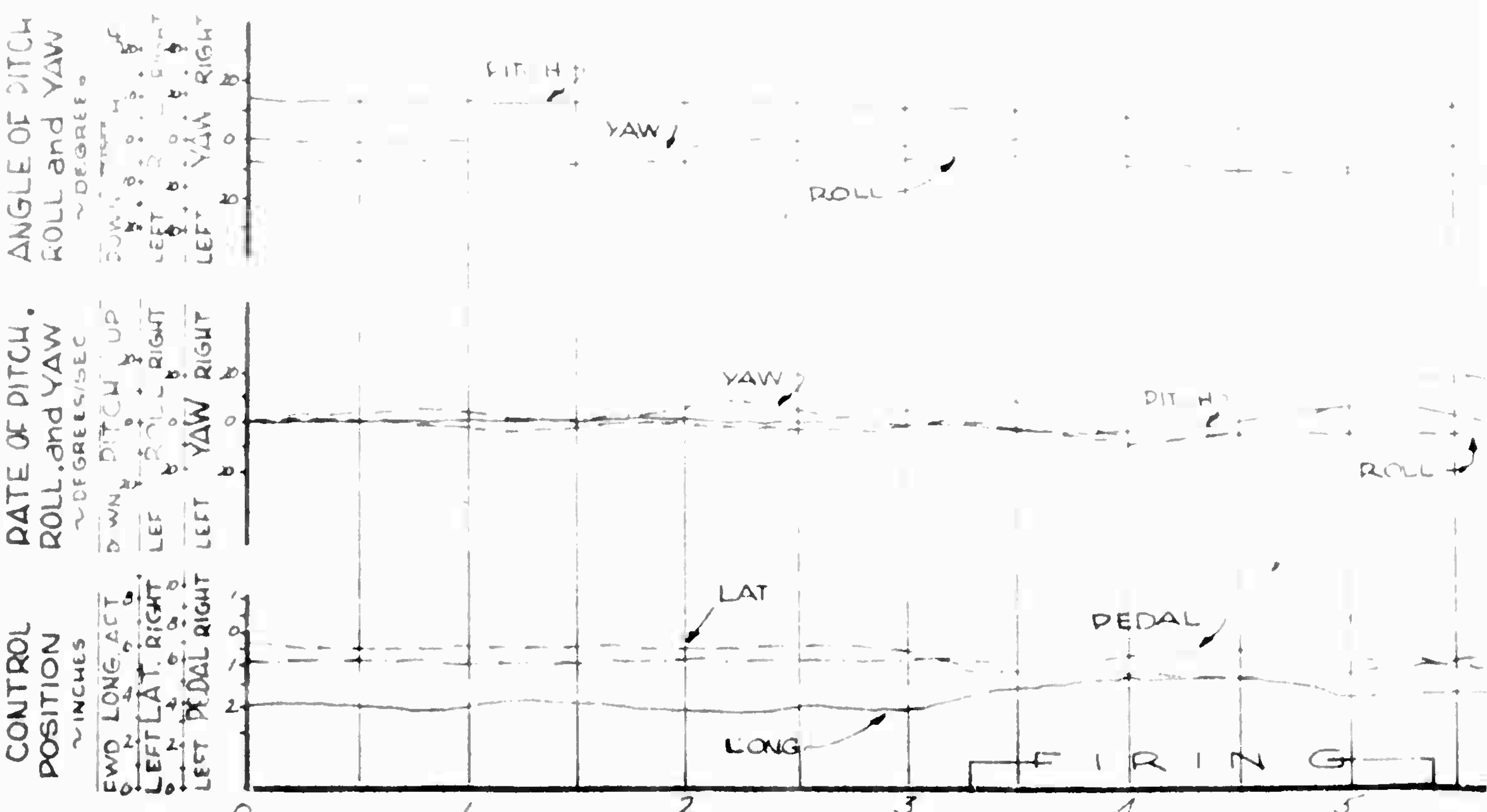
AVERAGE GROSS WEIGHT: [illegible]5.15 LBS
TRIM CAS: APPROX. 12 KNOTS (TRAN LAT

LONG CG LOCATION: 105.00 IN (AFT)
DENSITY ALTITUDE: [illegible] FEET

LATERAL CG LOCATION: 1.25 IN (LT)
ROTOR SPEED: 3[illegible] RPM

PITCH ——— and LONG STICK
ROLL - - - - and LAT STICK
YAW — - — - — and PEDAL

(PILOT HOLDING CONSTANT ATTITUDE)



FOR OFFICIAL USE ONLY

ARMAMENT FIRING

., S/N 62-4204

ND EFFECT)

LBS

ET)

LT)

FLIGHT CONDITION: LEFT SIDEWARD (SAE-ON)

TRIM CAS: APPROX. 12 KNOTS (TRANSLATION)

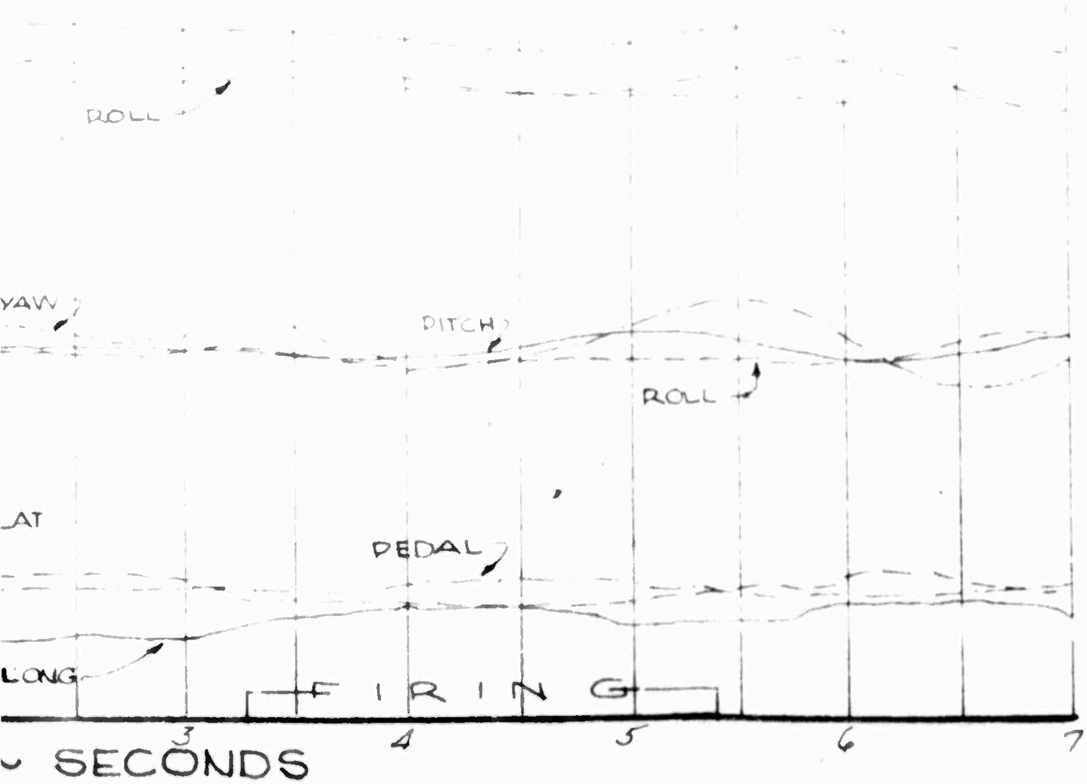
DENSITY ALTITUDE: 4[illegible] FEET

ROTOR SPEED: 394 RPM

YAW — - — - —

K and PEDAL

NT ATTITUDE)



IAL USE ONLY

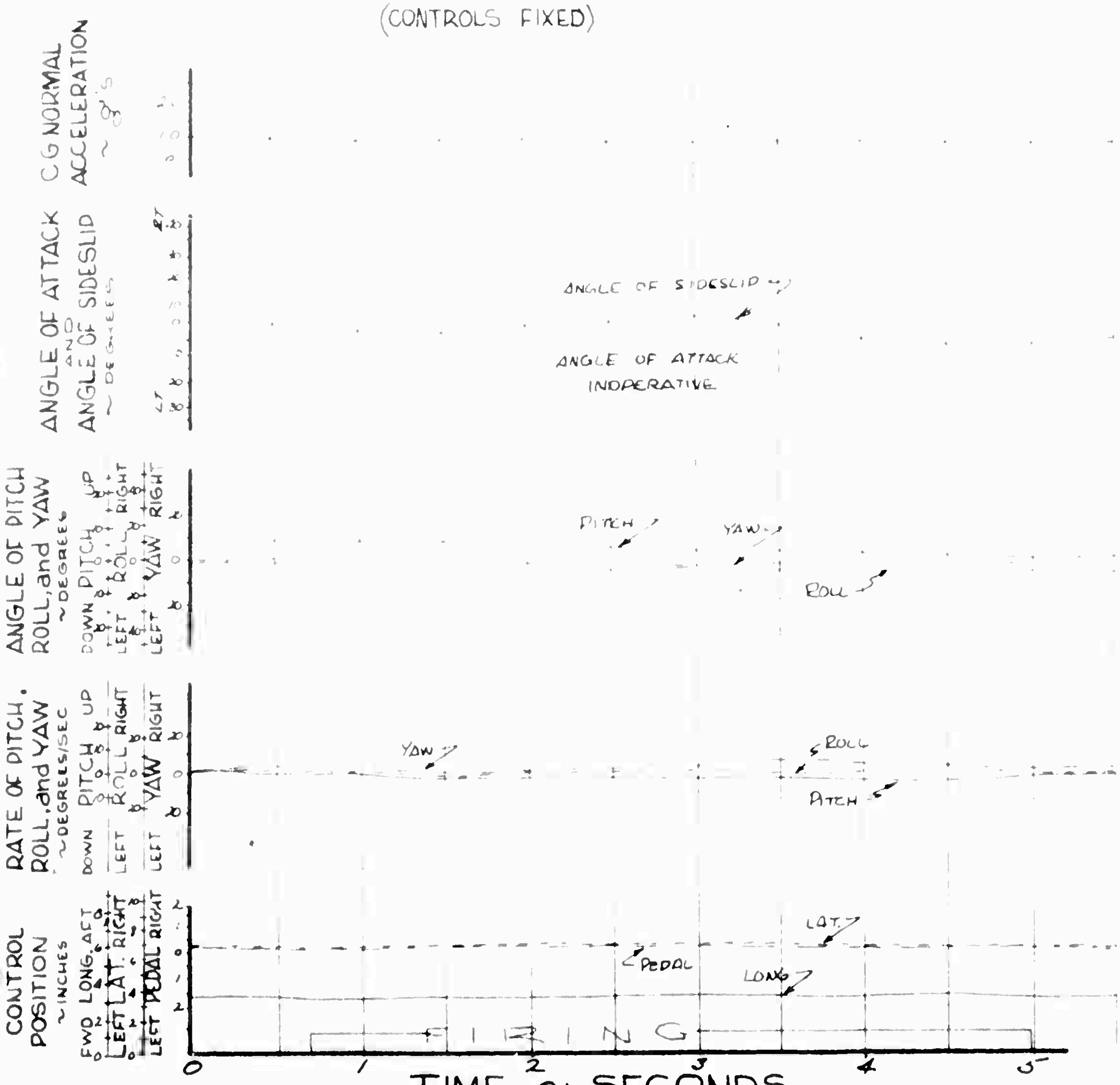
2

TIME HISTORY OF ARMAMENT FIRING
OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-7 (35° UP)
AVERAGE GROSS WEIGHT: 2515 LB.
LONG CG LOCATION: 104.90 IN (AFT)
LATERAL CG LOCATION: 1.05 IN. (LT)

FLIGHT CONDITION: LEVEL FLIGHT (SAE-OFF)
TRIM CAS: 35 KNOTS
DENSITY ALTITUDE: 4700 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG STICK
ROLL - - - - and LAT STICK
(CONTROLS FIXED)
YAW — - — - — and PEDAL



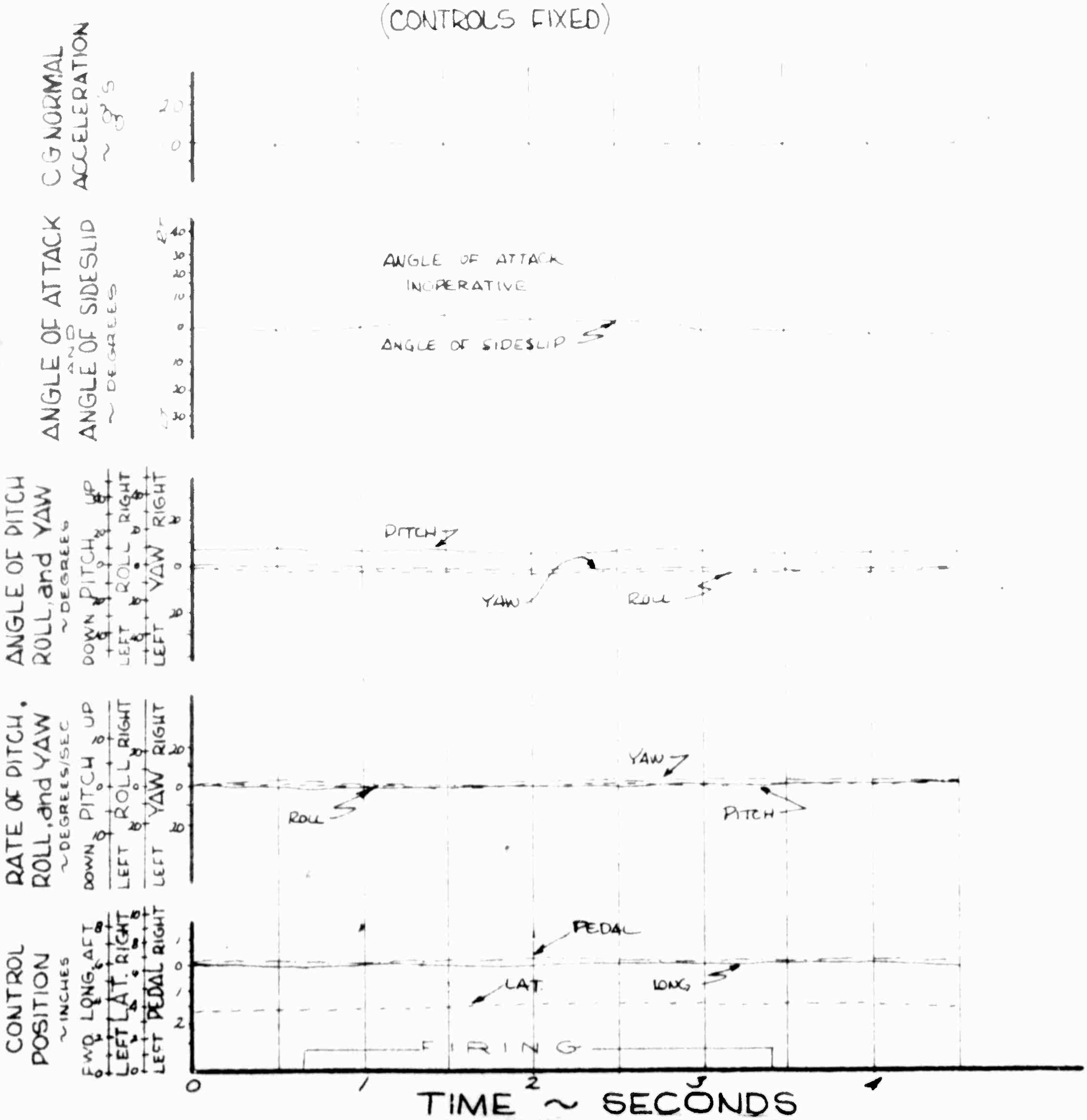
FOR OFFICAL USE ONLY

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-7 (3.5° UP)
AVERAGE GROSS WEIGHT: 2525 LBS.
LONG C.G. LOCATION: 104.90 IN (AFT)
LATERAL C.G. LOCATION: 1.10 IN (LT)

FLIGHT CONDITION: LEVEL FLIGHT (SAE-ON)
TRIM CAS: 35 KNOTS
DENSITY ALTITUDE: 4700 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG STICK
ROLL - - - - and LAT STICK (CONTROLS FIXED)
YAW — - — - — and PEDAL



FOR OFFICAL USE ONLY

FIGURE NO. 203

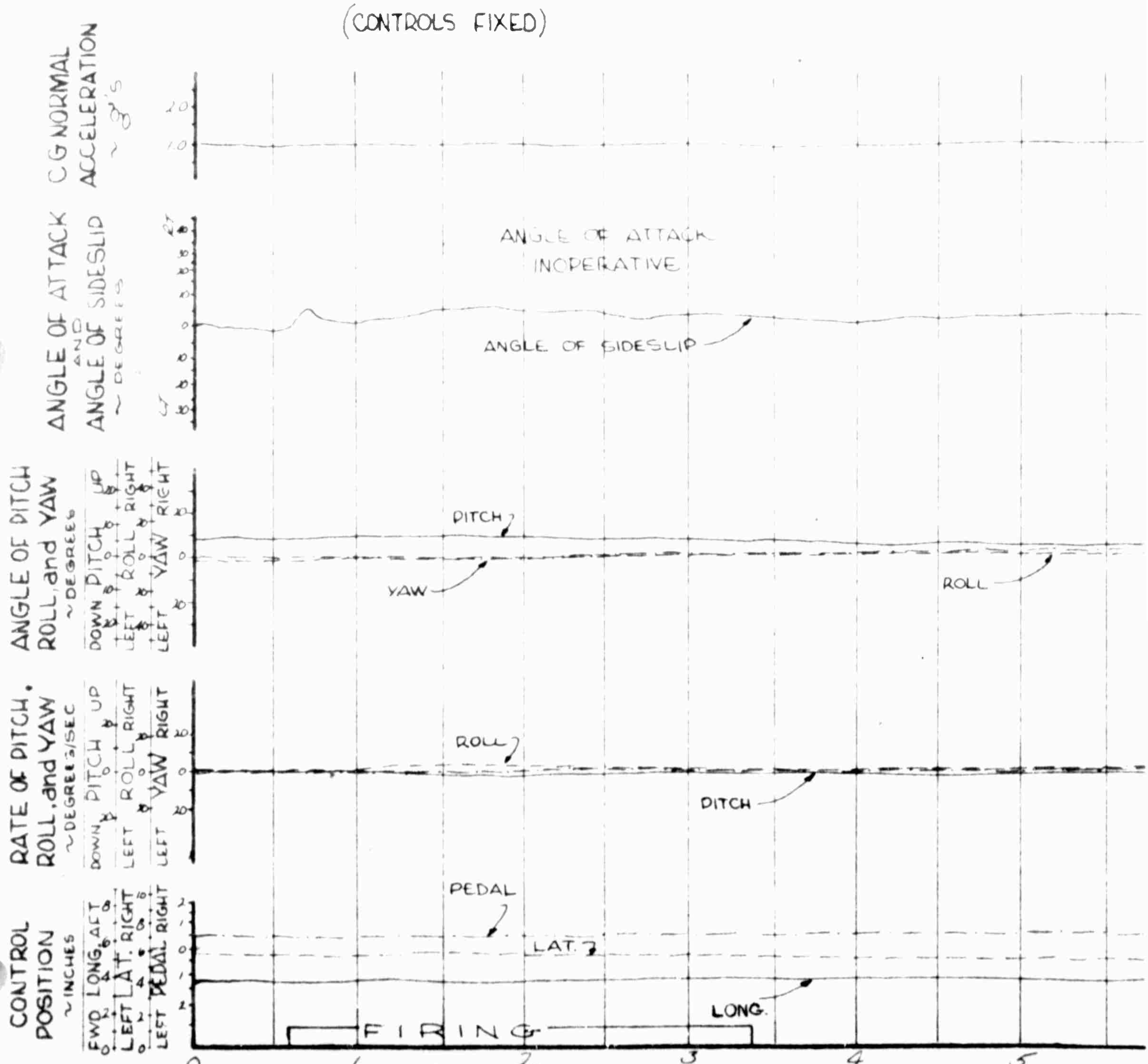
TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-7 (35° DOWN)
AVERAGE GROSS WEIGHT: 2505 LBS
LONG C.G. LOCATION: 104.80 IN (AFT)
LATERAL C.G. LOCATION: .30 IN (LT.)

FLIGHT CONDITION: LEVEL FLIGHT (SAE OFF)
TRIM CAS: 35 KNOTS
DENSITY ALTITUDE: 3860 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG STICK
ROLL - - - - and LAT STICK
YAW — - — - — and PEDAL
(CONTROLS FIXED)



TIME ~ SECONDS

FIGURE NO. 204

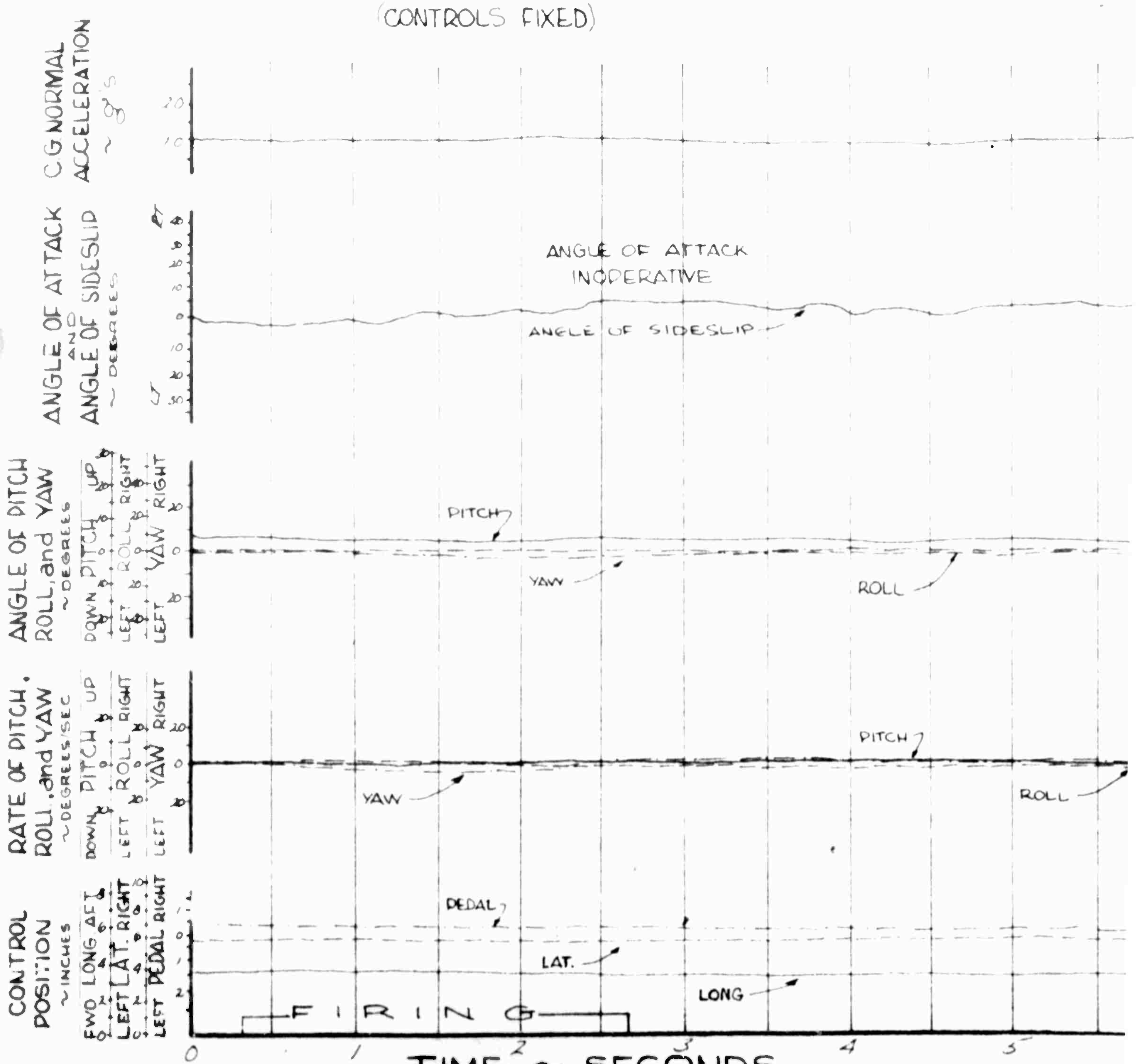
TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-7 (35° DOWN)
AVERAGE GROSS WEIGHT: 2495 LBS
LONG C.G. LOCATION: 104.75 IN (AFT)
LATERAL C.G. LOCATION: .85 IN (RT)

FLIGHT CONDITION: LEVEL FLIGHT (SAE ON)
TRIM CAS: 35 KNOTS
DENSITY ALTITUDE: 3860 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG STICK
ROLL - - - - and LAT. STICK
YAW — - — - — and PEDAL
(CONTROLS FIXED)



FOR OFFICAL USE ONLY

FIGURE NO. 205

TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-7 (3.5° UP)
AVERAGE GROSS WEIGHT: 2510 LBS.
LONG CG LOCATION: 105.00 IN. (AFT)
LATERAL CG LOCATION: 1.25 IN (LT)

FLIGHT CONDITION: RIGHT SIDESLIP (SAE OFF)
TRIM CAS: 35 KNOTS
DENSITY ALTITUDE: 4470 FEET
ROTOR SPEED: 394 RPM

PITCH and LONG STICK ——— ROLL and LAT STICK - - - - YAW and PEDAL — - — - —

(CONTROLS FIXED)

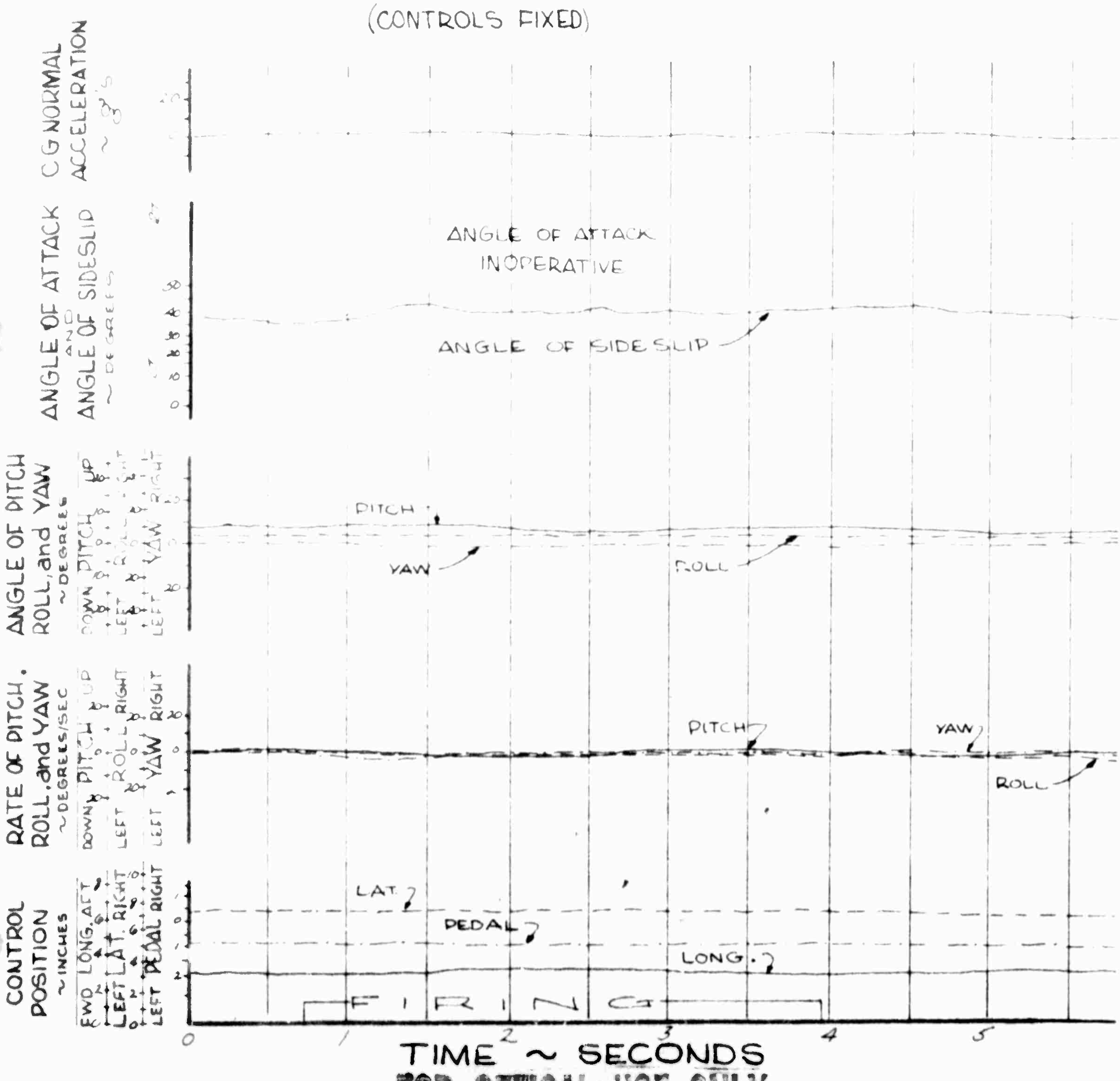


FIGURE NO 206

TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-7 (3.5° UP)
AVERAGE GROSS WEIGHT: 2530 LBS
LONG CG LOCATION: 105.05 IN. (AFT)
LATERAL CG LOCATION: 1.30 IN (LT)

FLIGHT CONDITION: RIGHT SIDESLIP (SAE-OH)
TRIM CAS: 35 KNOTS
DENSITY ALTITUDE: 4470 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG STICK
ROLL - - - - and LAT STICK (CONTROLS FIXED)
YAW — - — - — and PEDAL

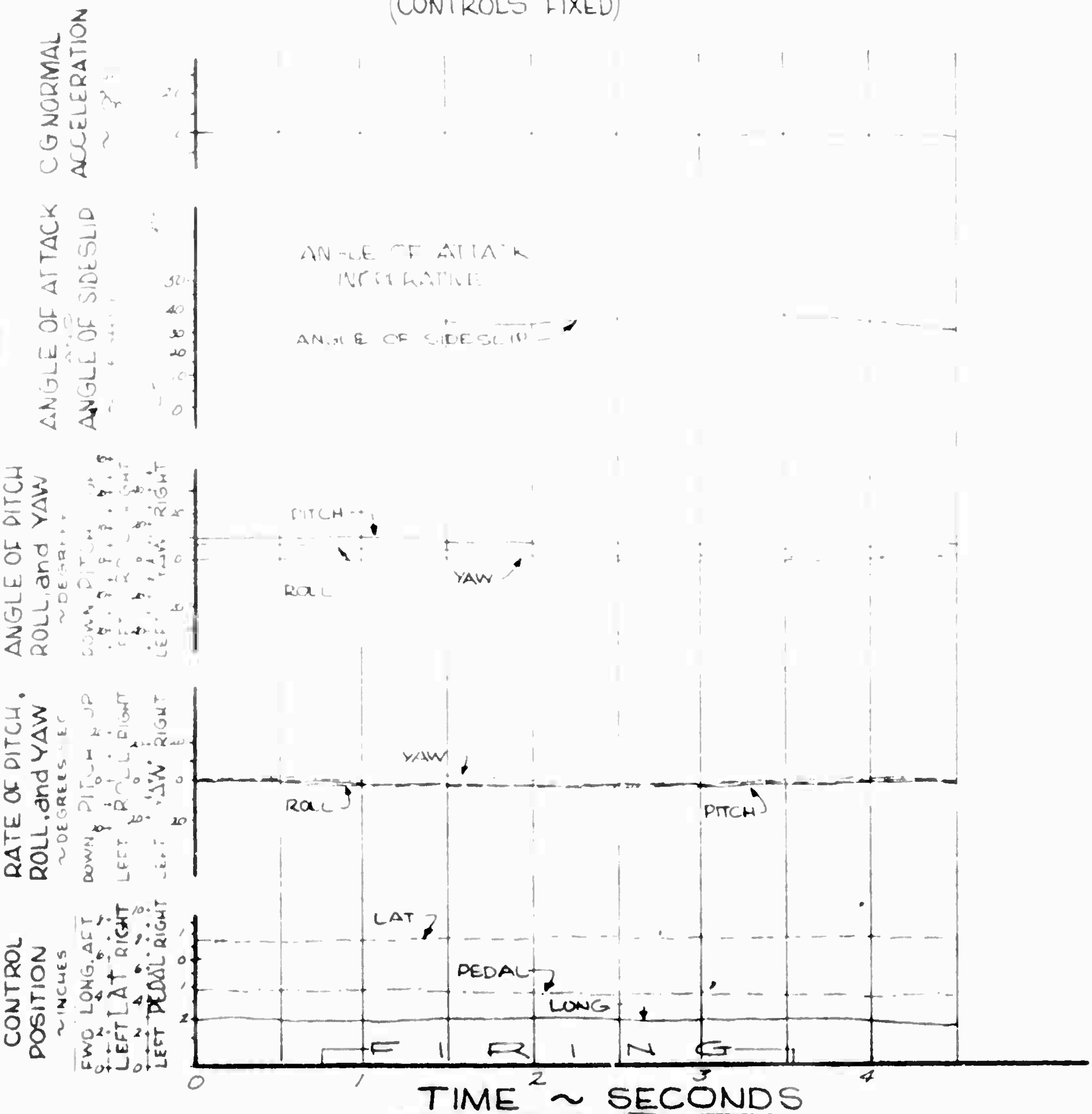


FIGURE NO. 207

TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-7 (35° DOWN)
AVERAGE GROSS WEIGHT: 2490 LBS
LONG C.G. LOCATION: 104.95 IN (AFT)
LATERAL C.G. LOCATION: 1.20 IN (LT.)

FLIGHT CONDITION: RIGHT SIDESLIP (SAE-OFF)
TRIM CAS: 35 KNOTS
DENSITY ALTITUDE: 4470 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG STICK
ROLL – – – – and LAT. STICK (CONTROLS FIXED)
YAW – · – · – and PEDAL

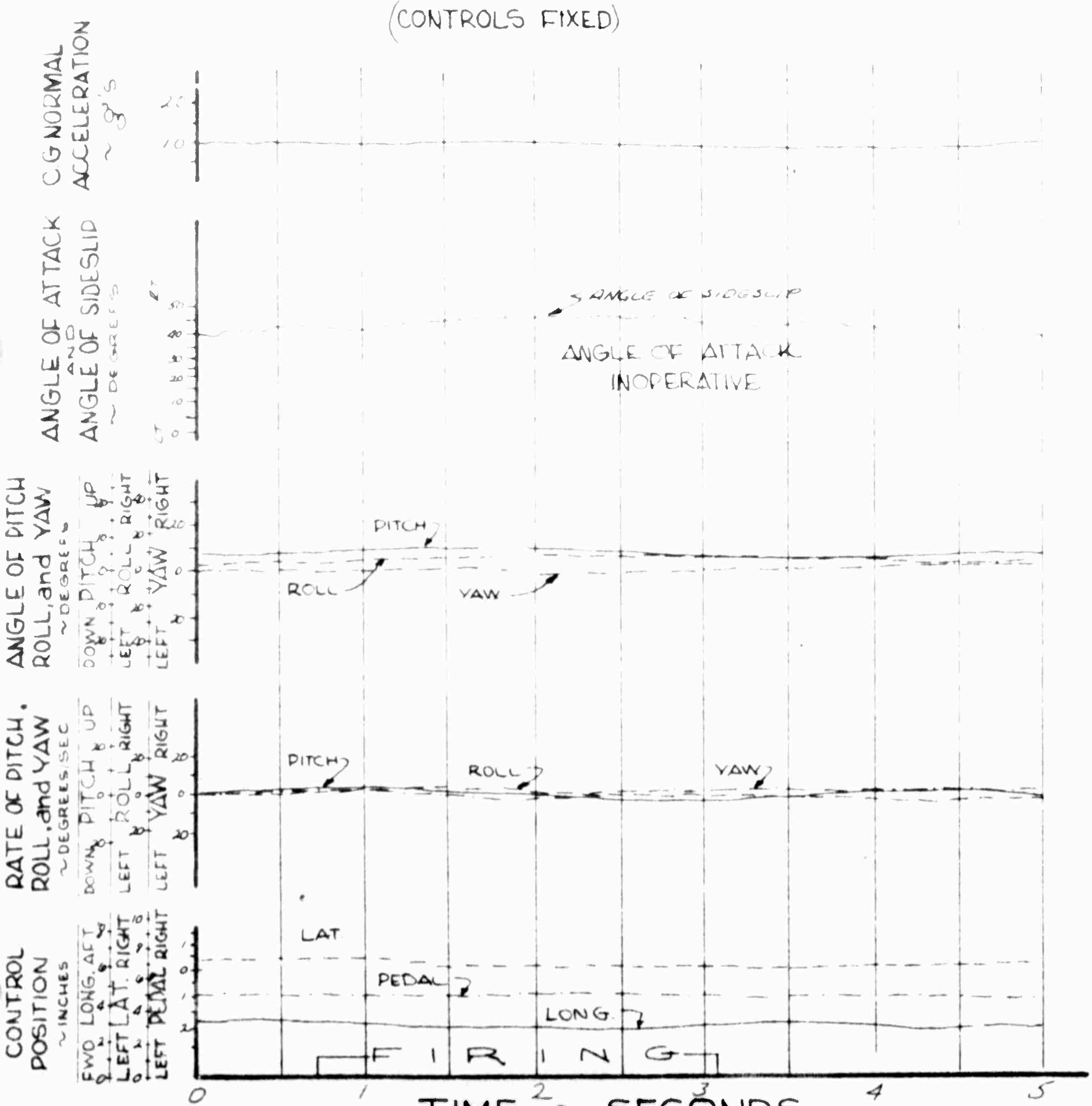


FIGURE NO 208

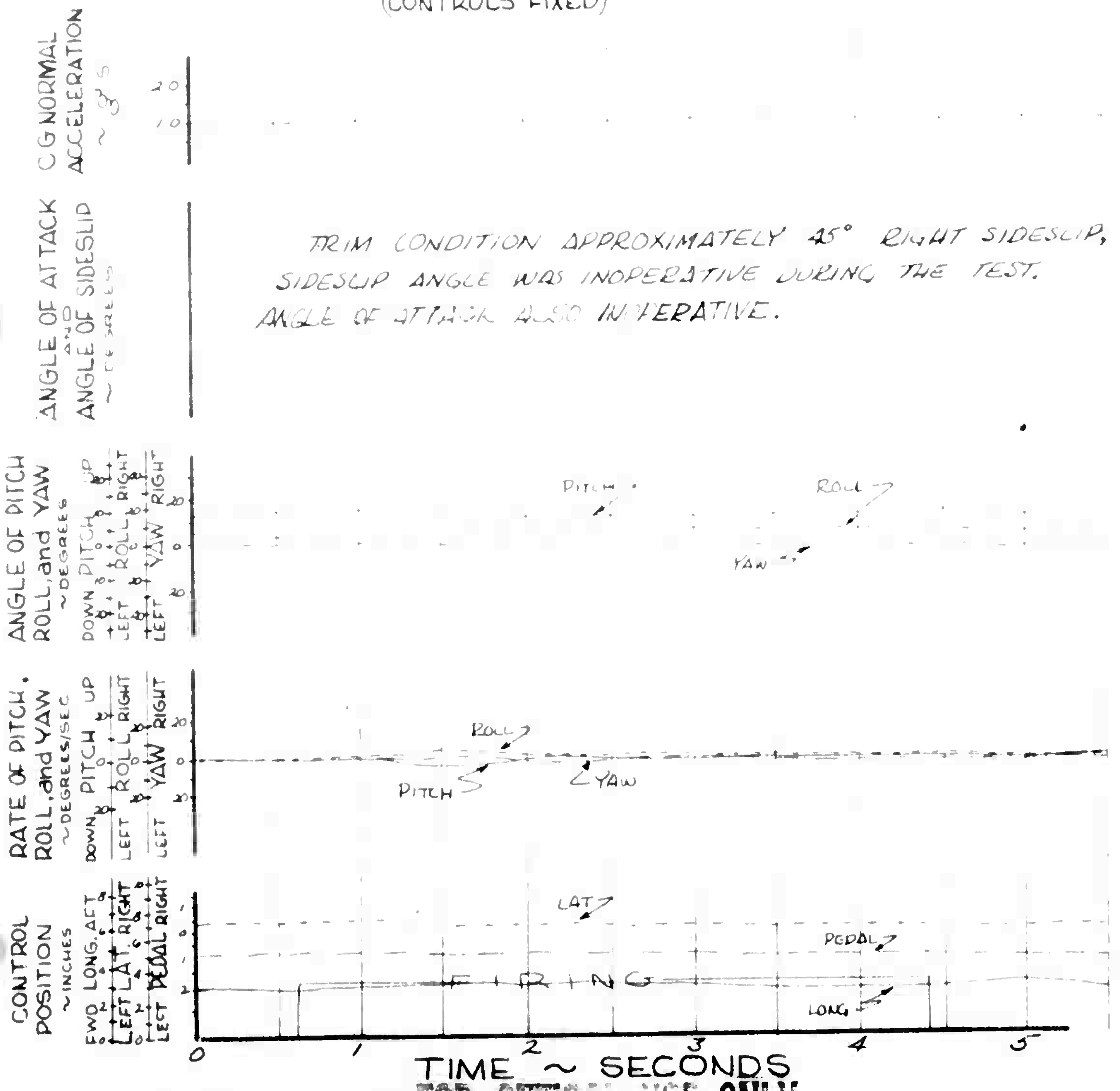
TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-7 (35° DOWN)
AVERAGE GROSS WEIGHT: 2460 LB
LONG C.G LOCATION: 104.90 IN. (AFT)
LATERAL CG LOCATION: 1.15 IN. (LT.)

FLIGHT CONDITION: RIGHT SIDESLIP (SAE-ON)
TRIM CAS: 35 KNOTS
DENSITY ALTITUDE: 4410 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG STICK
ROLL - - - - and LAT STICK (CONTROLS FIXED)
YAW — - — - — and PEDAL



FOR OFFICIAL USE ONLY

FIGURE NO. 209

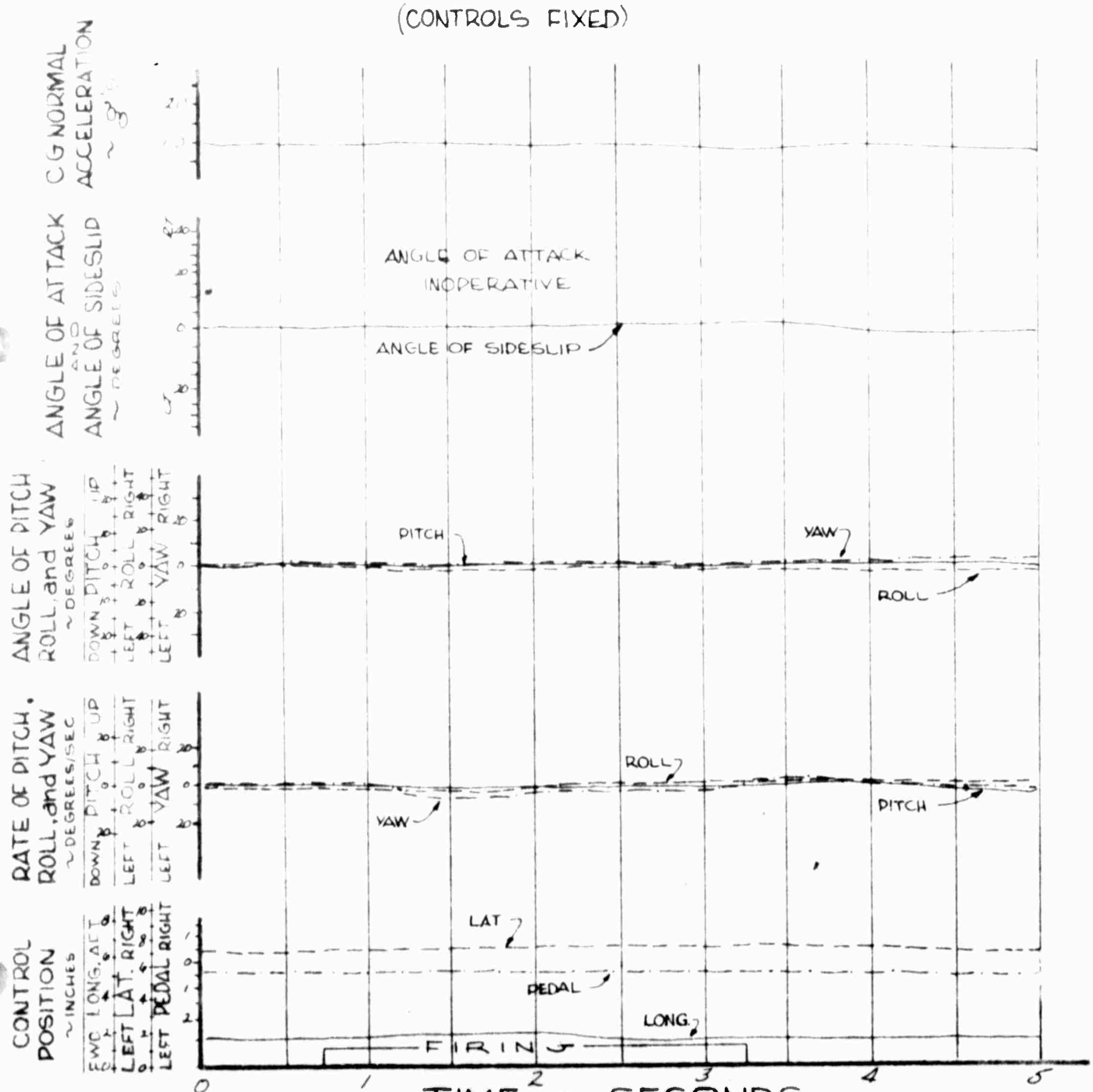
TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-7 (3.5° UP)
AVERAGE GROSS WEIGHT: 2440 LBS
LONG C.G. LOCATION: 104.80 IN (AFT)
LATERAL C.G. LOCATION: 1.05 IN (LT)

FLIGHT CONDITION: SLIGHT DIVE (SAE-OFF)
TRIM CAS: 112 KNOTS
DENSITY ALTITUDE: 4470 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG STICK
ROLL - - - - and LAT. STICK (CONTROLS FIXED)
YAW — - — - — and PEDAL



FOR OFFICIAL USE ONLY

FIGURE NO 210

TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

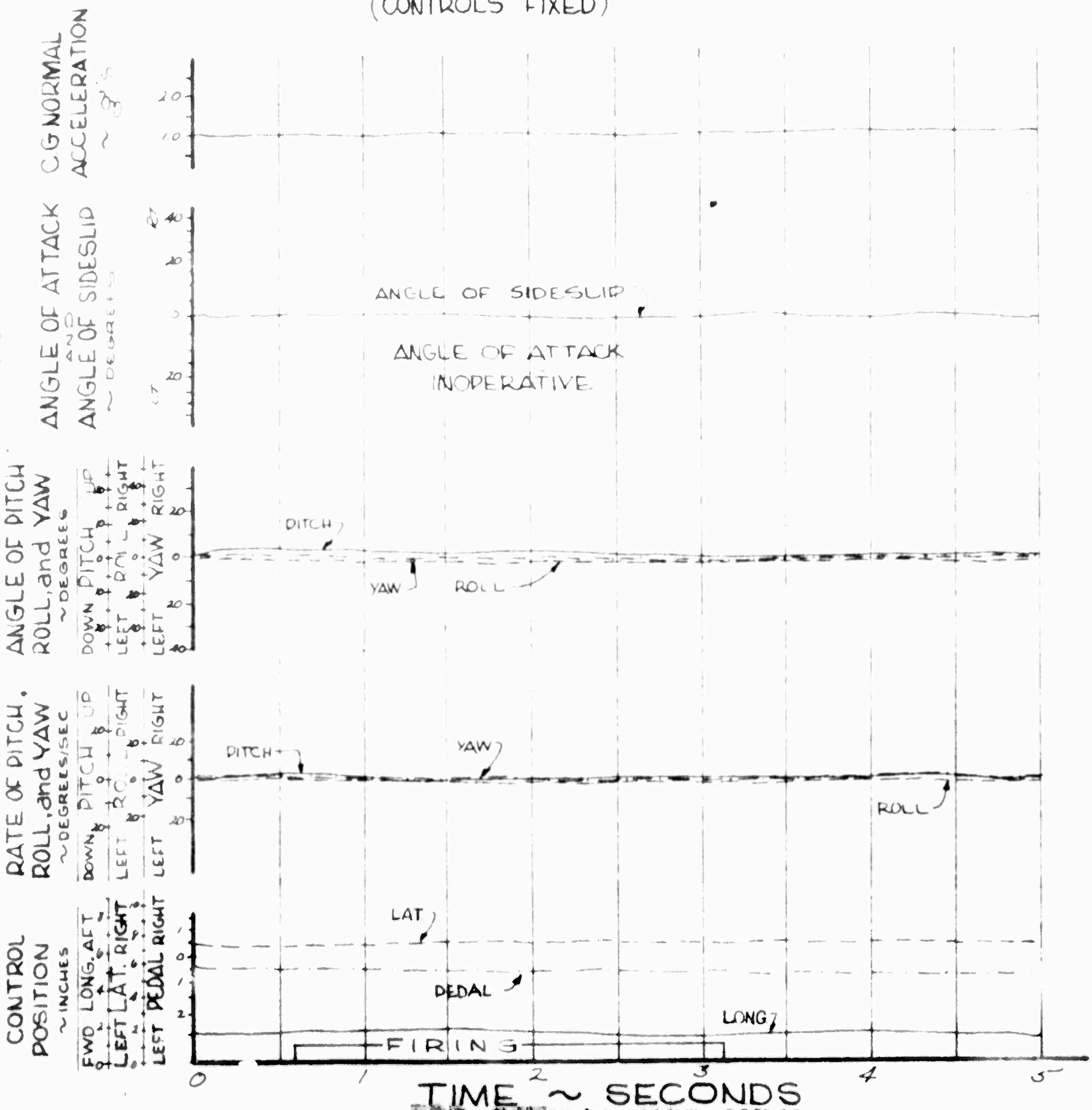
CONFIGURATION: XM-7 (3.5° UP)
AVERAGE GROSS WEIGHT: 2450 LBS
LONG C.G LOCATION: 104.85 IN (AFT)
LATERAL C.G LOCATION: 1.10 IN (LT)

FLIGHT CONDITION: SLIGHT DIVE (SAE ON)
TRIM CAS: 113 KNOTS
DENSITY ALTITUDE: 4470 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG STICK

ROLL - - - - and LAT STICK (CONTROLS FIXED)

YAW — - — - — and PEDAL



FOR OFFICAL USE ONLY

FIGURE NO. 211

TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-7 (35° DOWN)
AVERAGE GROSS WEIGHT: 2425 LB
LONG CG LOCATION: 104.78 IN. (AFT)
LATERAL CG LOCATION: 1.00 IN. (LT)

FLIGHT CONDITION: SLIGHT DIVE (SAE-OFF)
TRIM CAS: 111 KNOTS
DENSITY ALTITUDE: 4470 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG STICK
ROLL - - - - and LAT STICK (CONTROLS FIXED)
YAW — - — - — and PEDAL

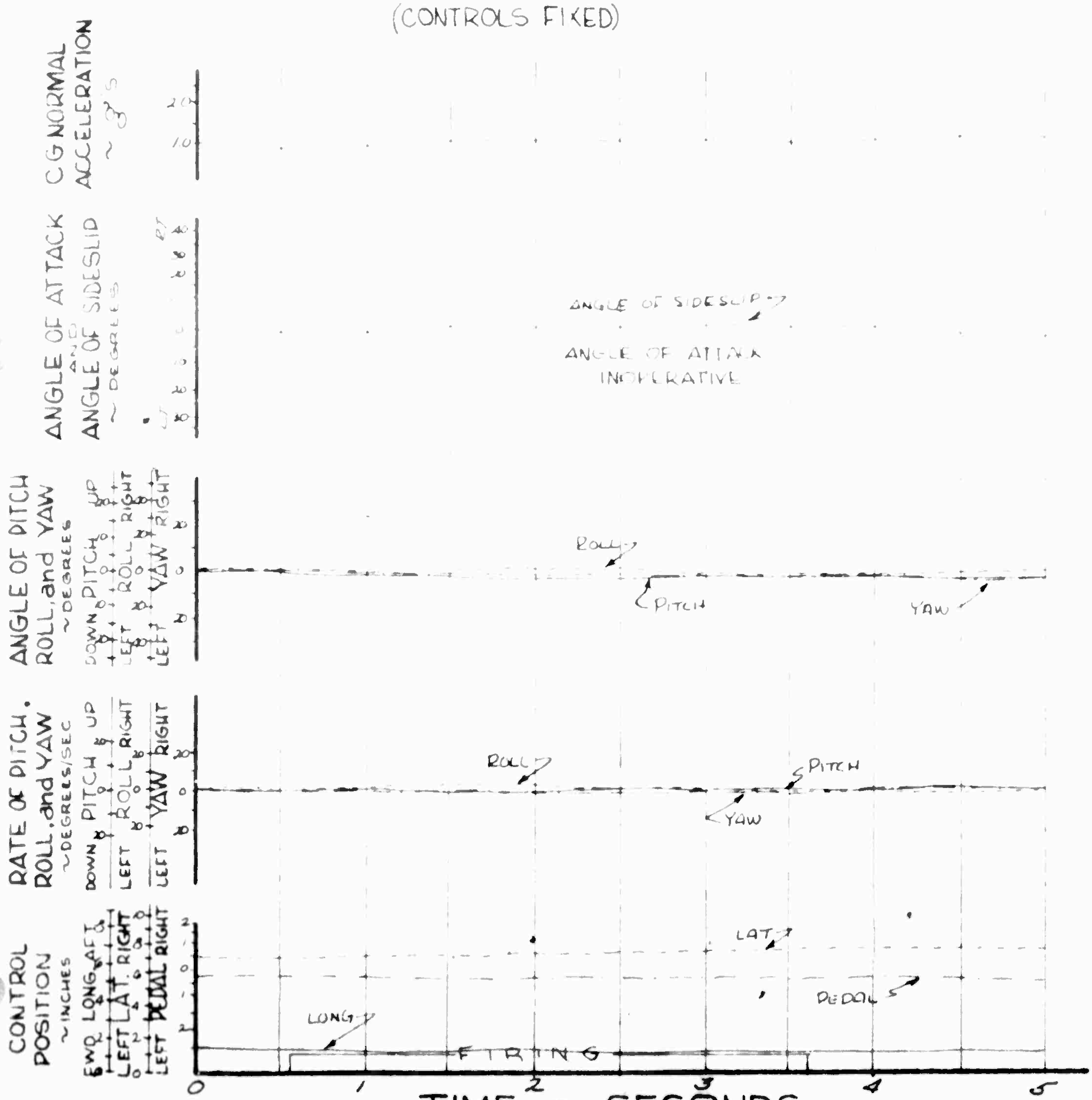


FIGURE NO. 212

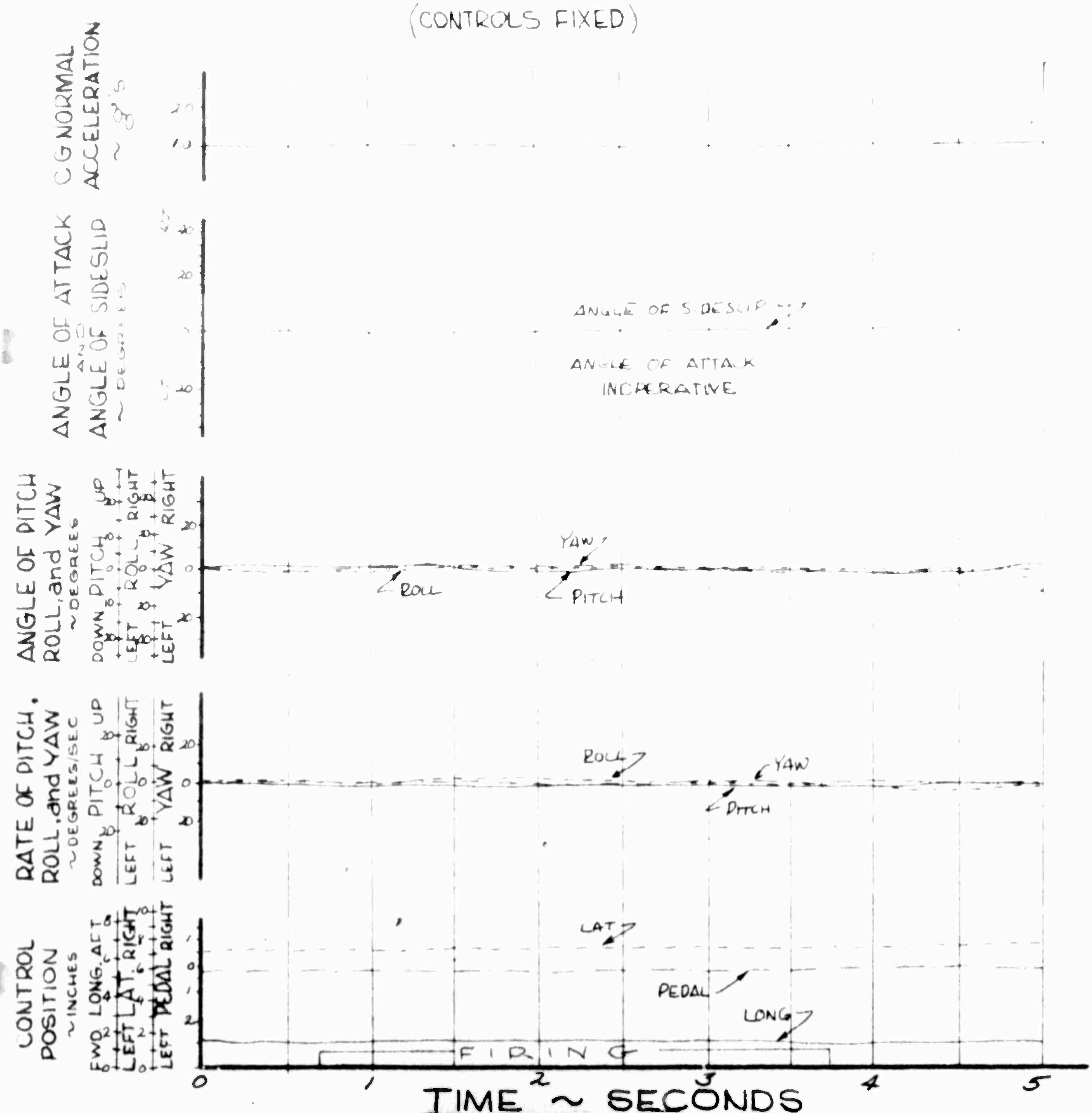
TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-7 (35° DOWN)
AVERAGE GROSS WEIGHT: 2435 LB
LONG C.G. LOCATION: 104.80 IN. (AFT)
LATERAL C.G. LOCATION: 1.05 IN. (LT)

FLIGHT CONDITION: SLIGHT DIVE (SAE-ON)
TRIM CAS: 111 KNOTS
DENSITY ALTITUDE: 4470 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG STICK
ROLL - - - - and LAT. STICK (CONTROLS FIXED)
YAW — - — - — and PEDAL



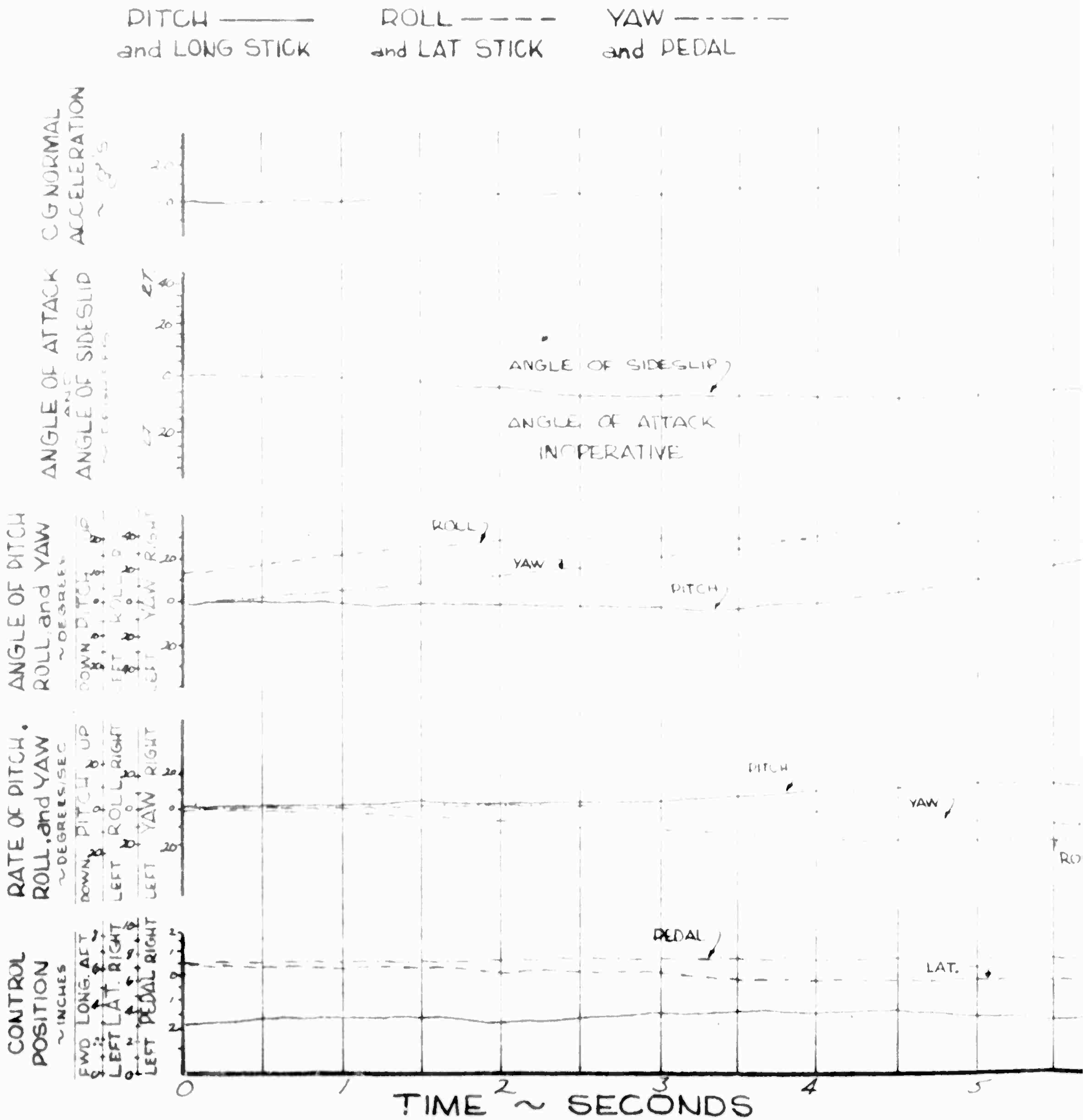
FOR OFFICAL USE ONLY

FIGURE NO 213

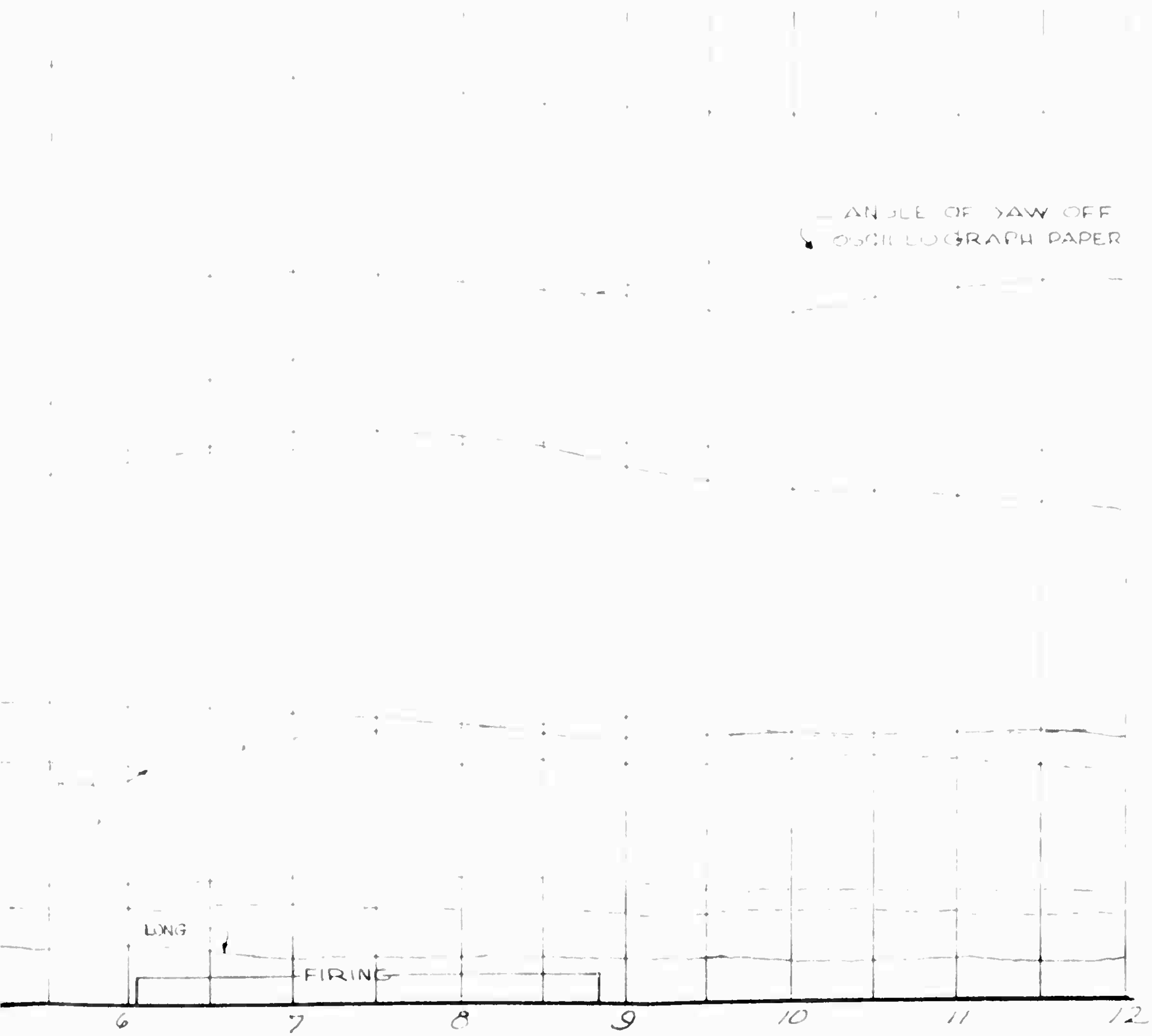
TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM 7 (3.5° UP)	FLIGHT CONDITION: RT. ROLLING PULL UP
AVERAGE GROSS WEIGHT: 2380 LBS	TRIM CAS: 93 KNOTS
LONG CG LOCATION: 104.65 IN (AFT)	DENSITY ALTITUDE: 4470 FEET
LATERAL CG LOCATION: .95 IN (LT)	ROTOR SPEED: 394 RPM



FOR OFFICIAL USE ONLY


ANGLE OF YAW OFF
OSCILLOGRAPH PAPER
LONG
FIRING
6
7
8
9
10
11
12

2 275

FIGURE NO 214

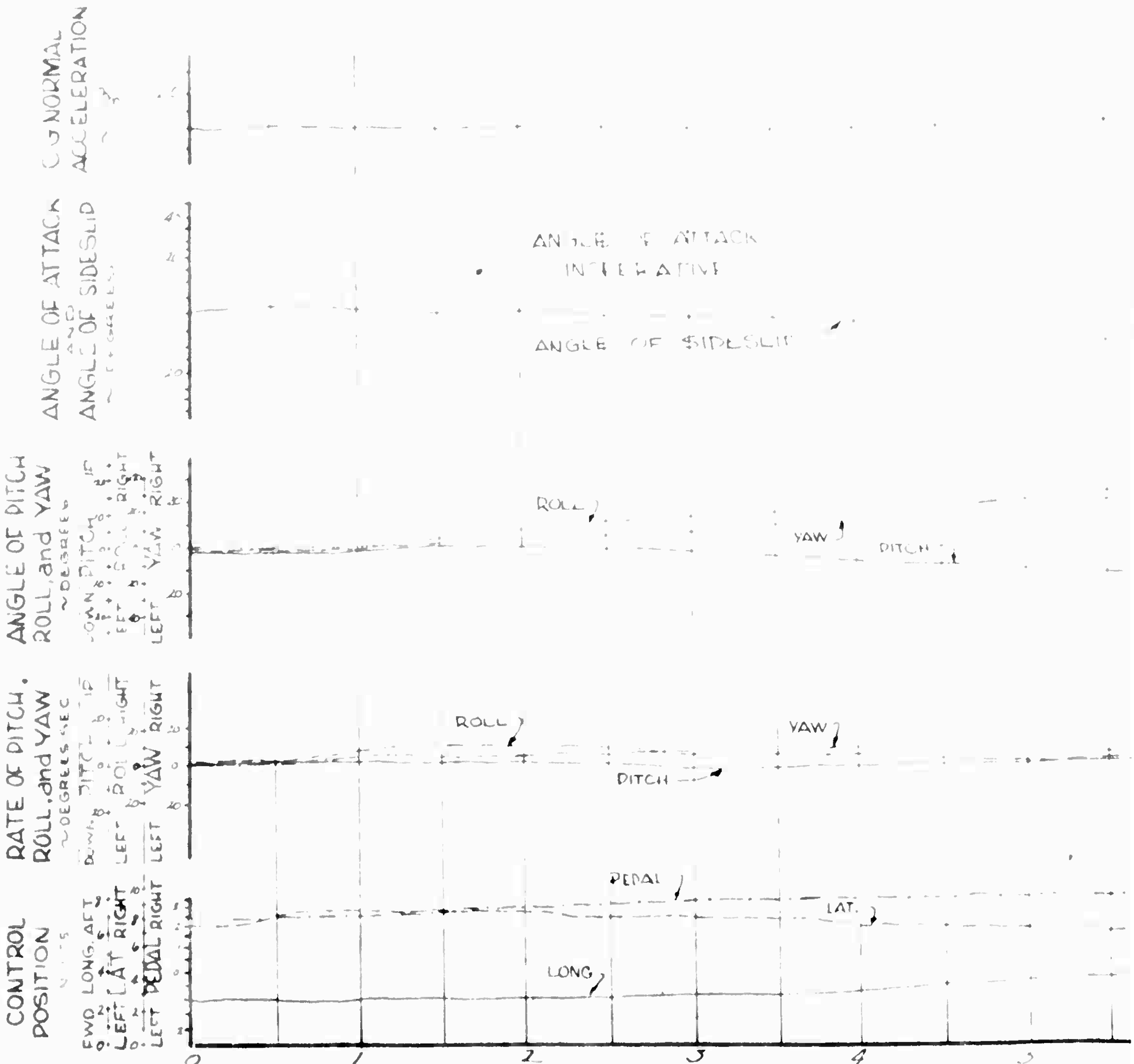
TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-7 (3.5° UP)
AVERAGE GROSS WEIGHT: 2400 LBS
LONG CG LOCATION: 104.70 IN (AFT)
LATERAL CG LOCATION: 1.00 IN (LT)

FLIGHT CONDITION: RT ROLLING PULL UP (SA
TRIM CAS: 93 KNOTS
DENSITY ALTITUDE: 4410 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG STICK
ROLL - - - - and LAT STICK
YAW — - — - and PEDAL



FOR OFFICIAL USE ONLY

LL-UP N

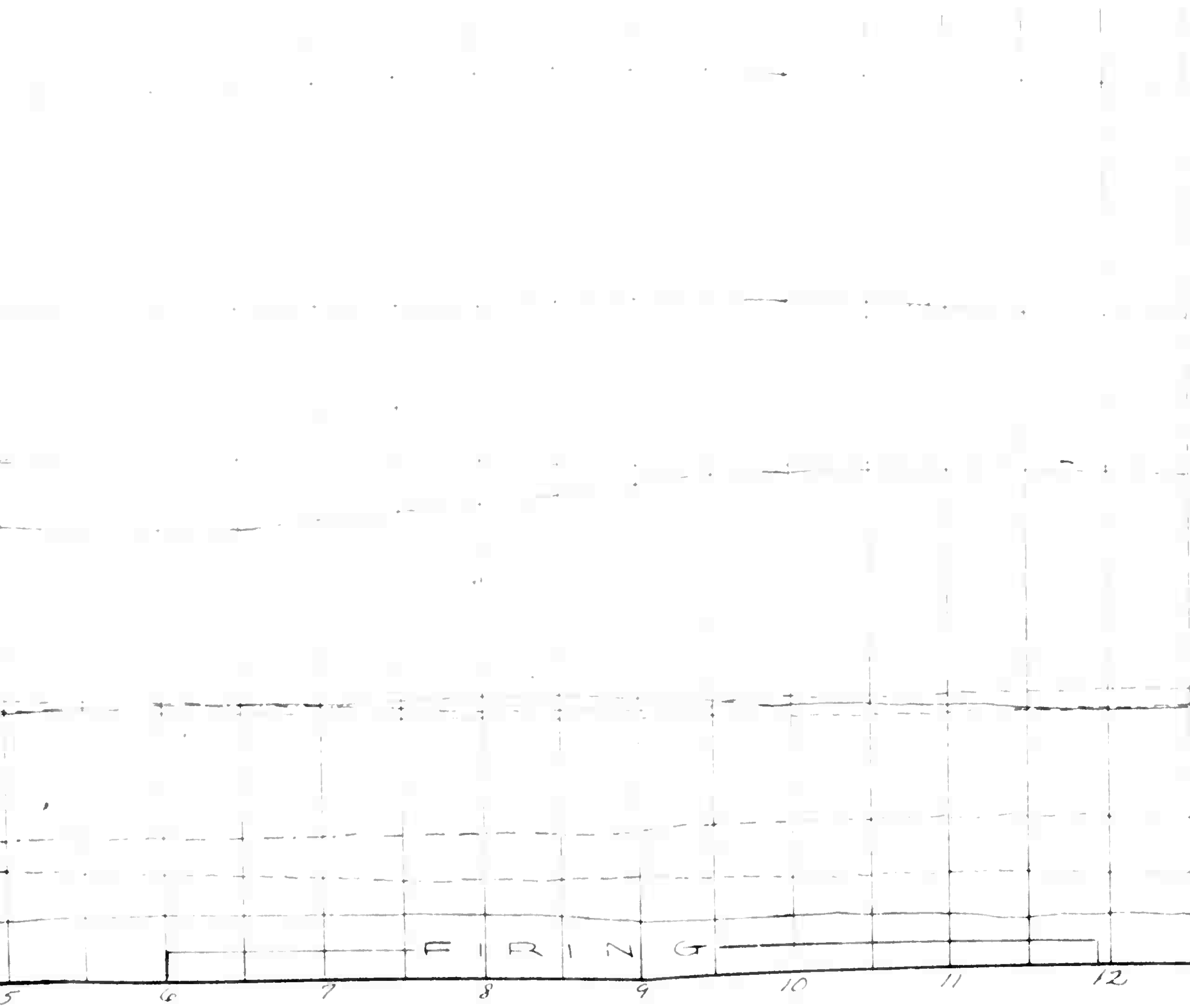


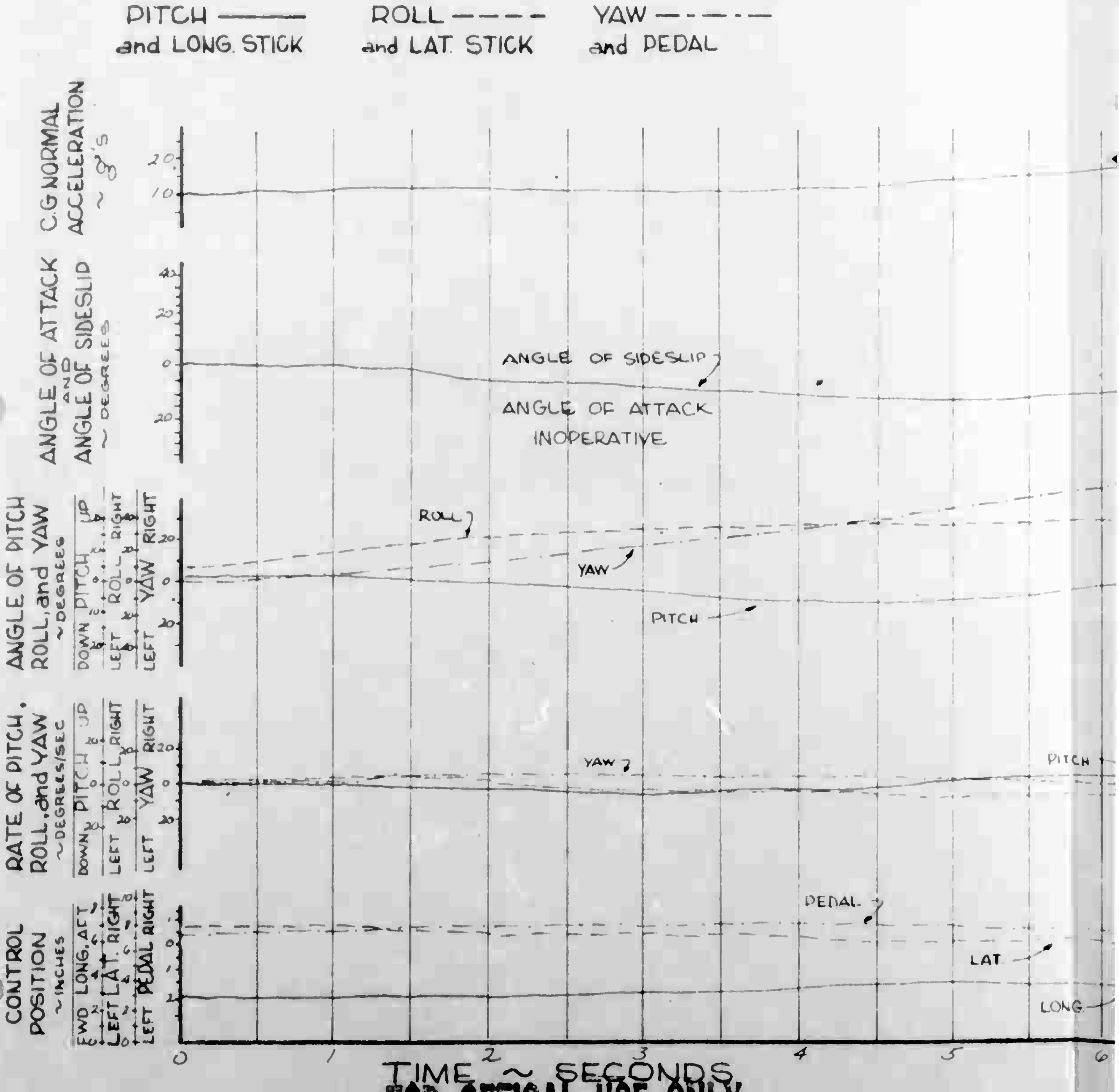
FIGURE NO. 215

TIME HISTORY OF ARMAMENT FIRING

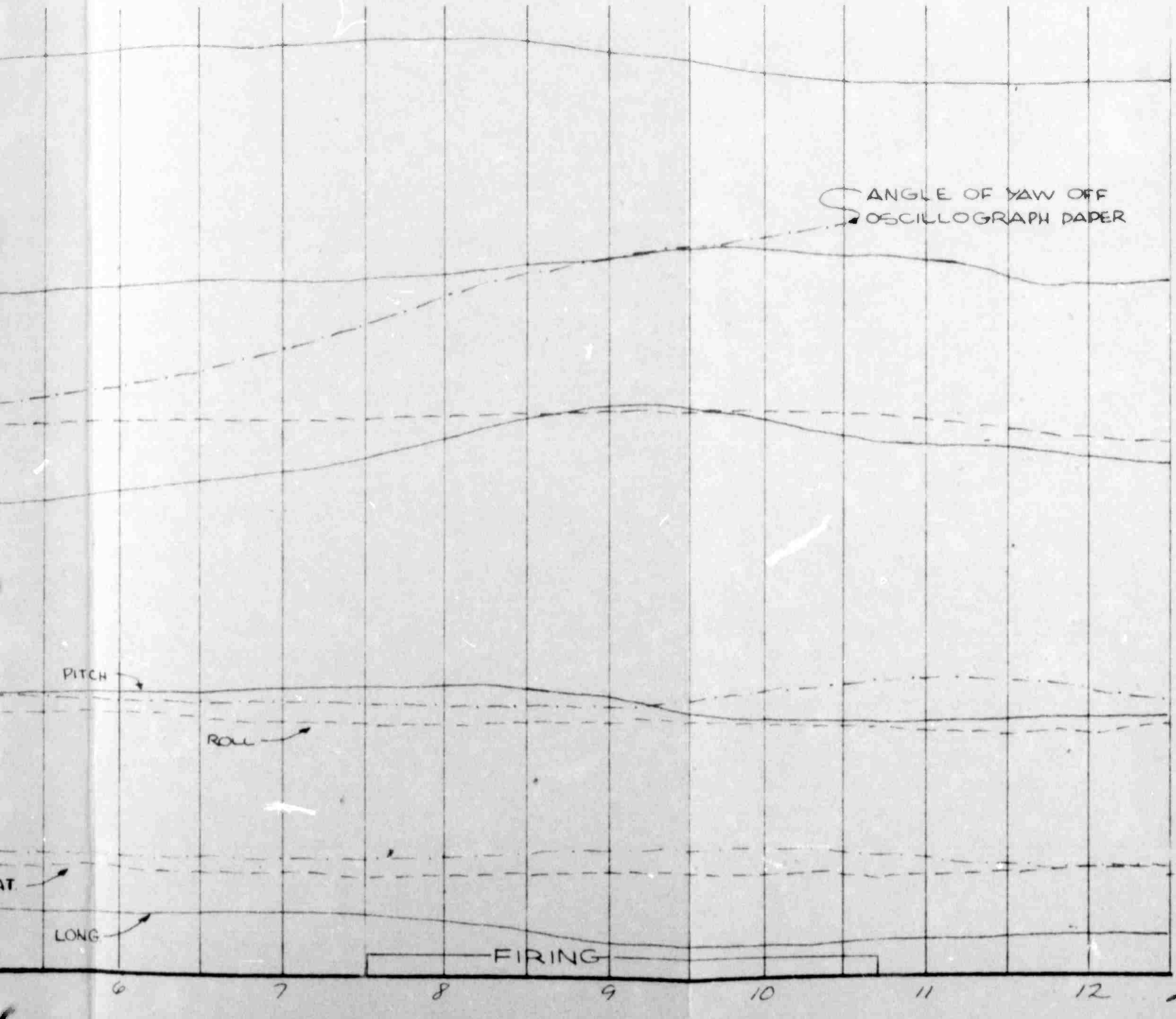
OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-7 (35° DOWN)
AVERAGE GROSS WEIGHT: 2370 LBS.
LONG C.G. LOCATION: 104.65 IN. (AFT)
LATERAL C.G. LOCATION: .95 IN. (LT)

FLIGHT CONDITION: RT. ROLLING PULL-UP (SAE-OFF
TRIM CAS: 93 KNOTS
DENSITY ALTITUDE: 4470 FEET
ROTOR SPEED: 394 RPM



- UP (SAE OFF)



ANGLE OF YAW OFF
OSCILLOGRAPH PAPER
PITCH
ROLL
LAT.
LONG
FIRING
6
7
8
9
10
11
12

2

FIGURE NO. 216

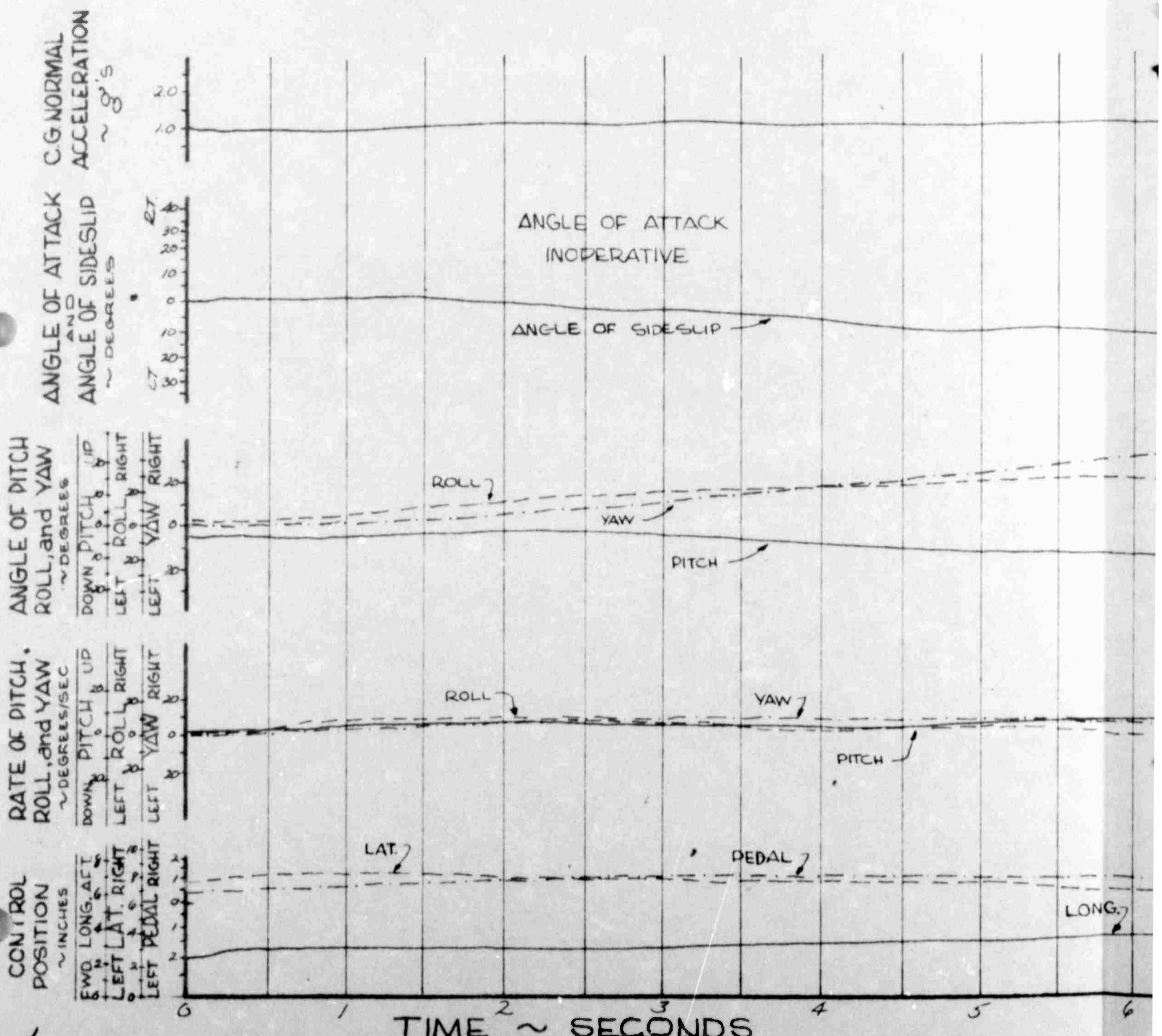
TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-7 (35° DOWN)
AVERAGE GROSS WEIGHT: 2390 LBS.
LONG. C.G. LOCATION: 104.70 IN (AFT)
LATERAL C.G. LOCATION: .95 IN. (LT)

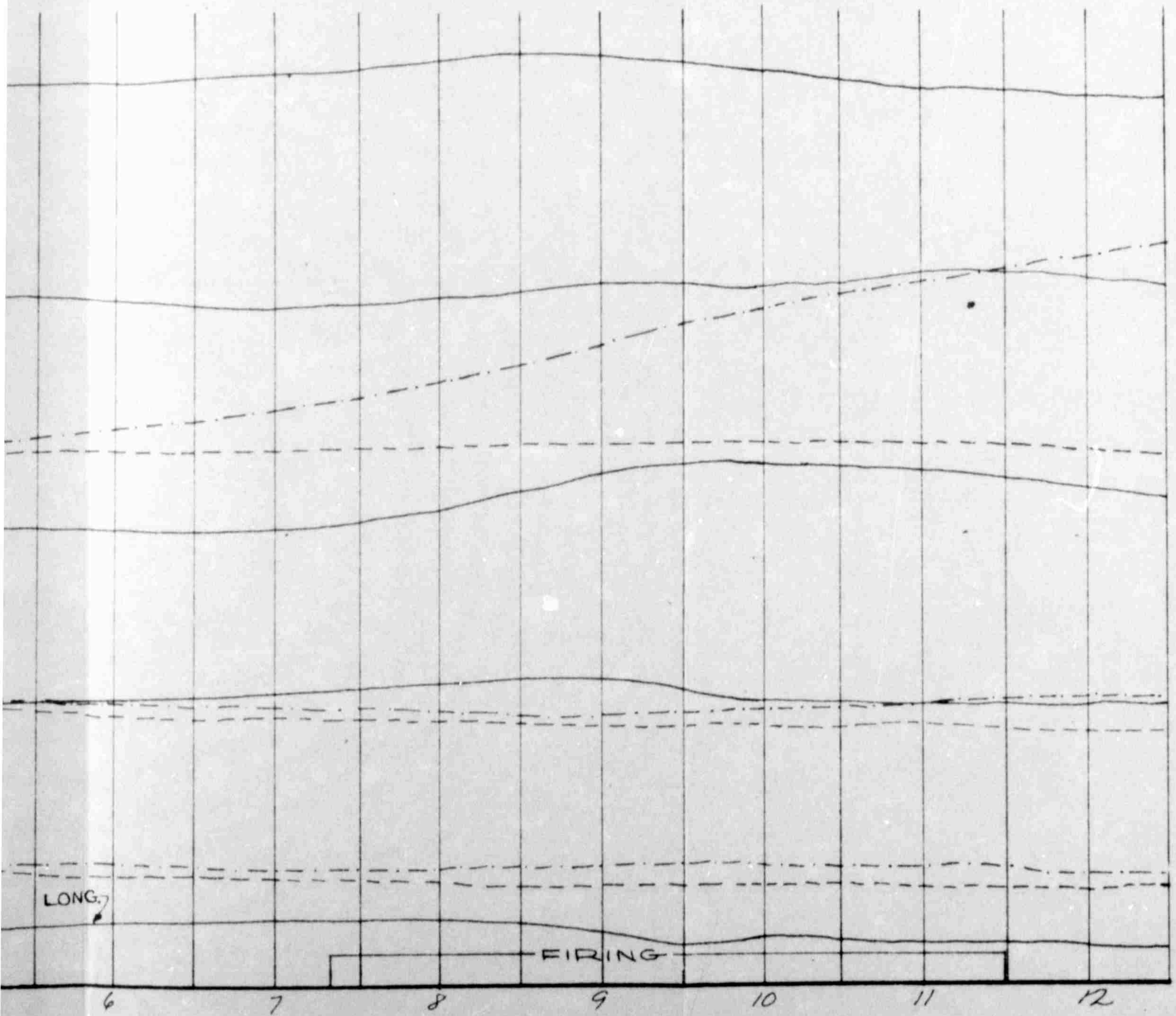
FLIGHT CONDITION: RT. ROLLING PULL-UP (SAE-ON)
TRIM CAS: 93 KNOTS
DENSITY ALTITUDE: 4470 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG. STICK
ROLL – – – – and LAT. STICK
YAW – · – · – and PEDAL



FOR OFFICAL USE ONLY

IP(SAE-ON)



2

FIGURE NO. 217

TIME HISTORY OF ARMAMENT FIRING

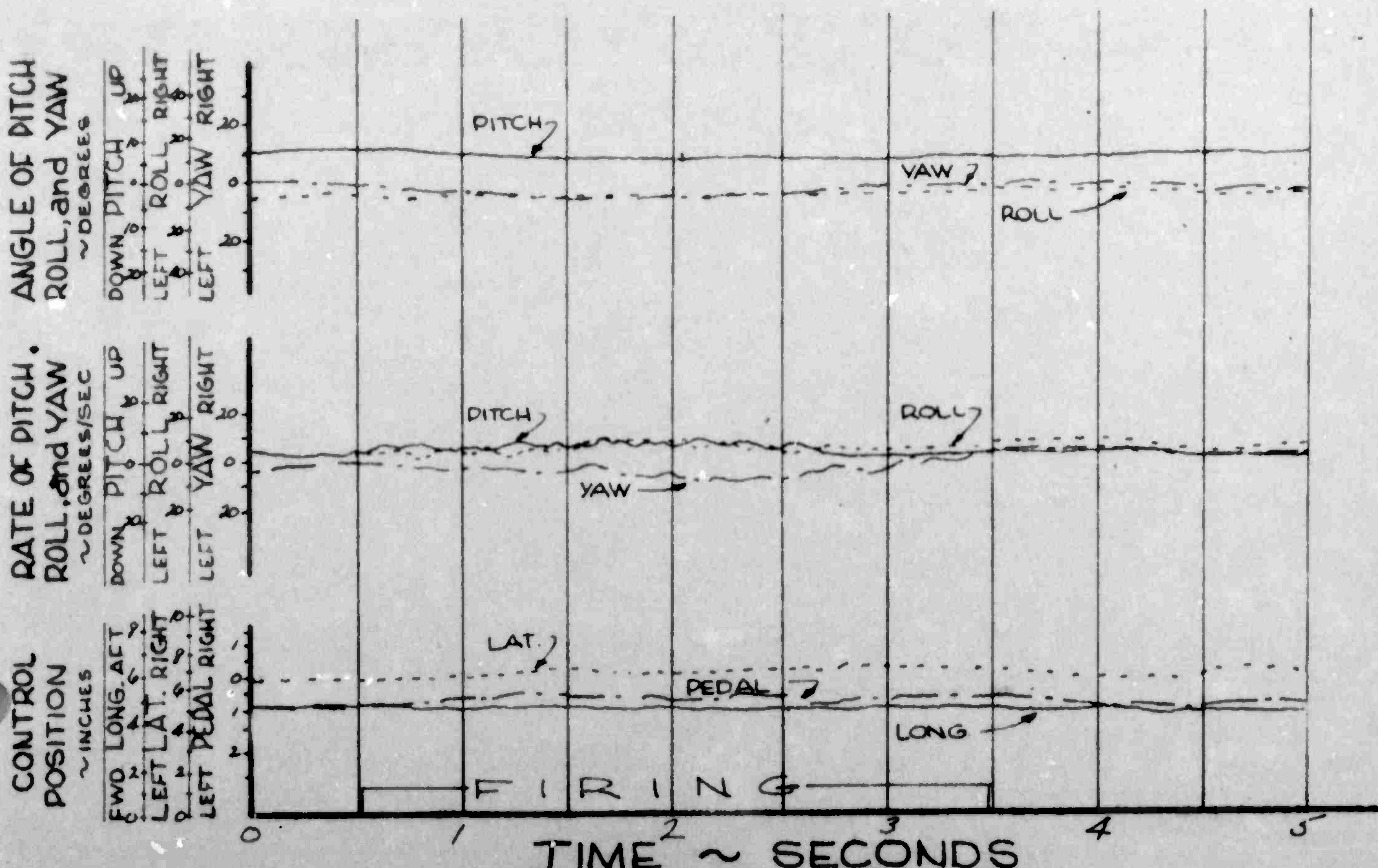
OH-4A, U.S.A., S/N 62-4204

(IN GROUND EFFECT)

CONFIGURATION: XM-8 (3.5° UP)
FLIGHT CONDITION: HOVER (SAE-OFF)
AVERAGE GROSS WEIGHT: 2530 LBS.
TRIM CAS: ZERO
LONG. C.G. LOCATION: 105.45 IN. (AFT)
DENSITY ALTITUDE: 4120 FEET
LATERAL C.G. LOCATION: 1.00 IN. (LT.)
ROTOR SPEED: 394 RPM

PITCH ——— and LONG. STICK
ROLL - - - - and LAT. STICK
YAW - - - - - and PEDAL

(CONTROLS FIXED)



FOR OFFICAL USE ONLY

FIGURE NO. 218

TIME HISTORY OF ARMAMENT FIRING

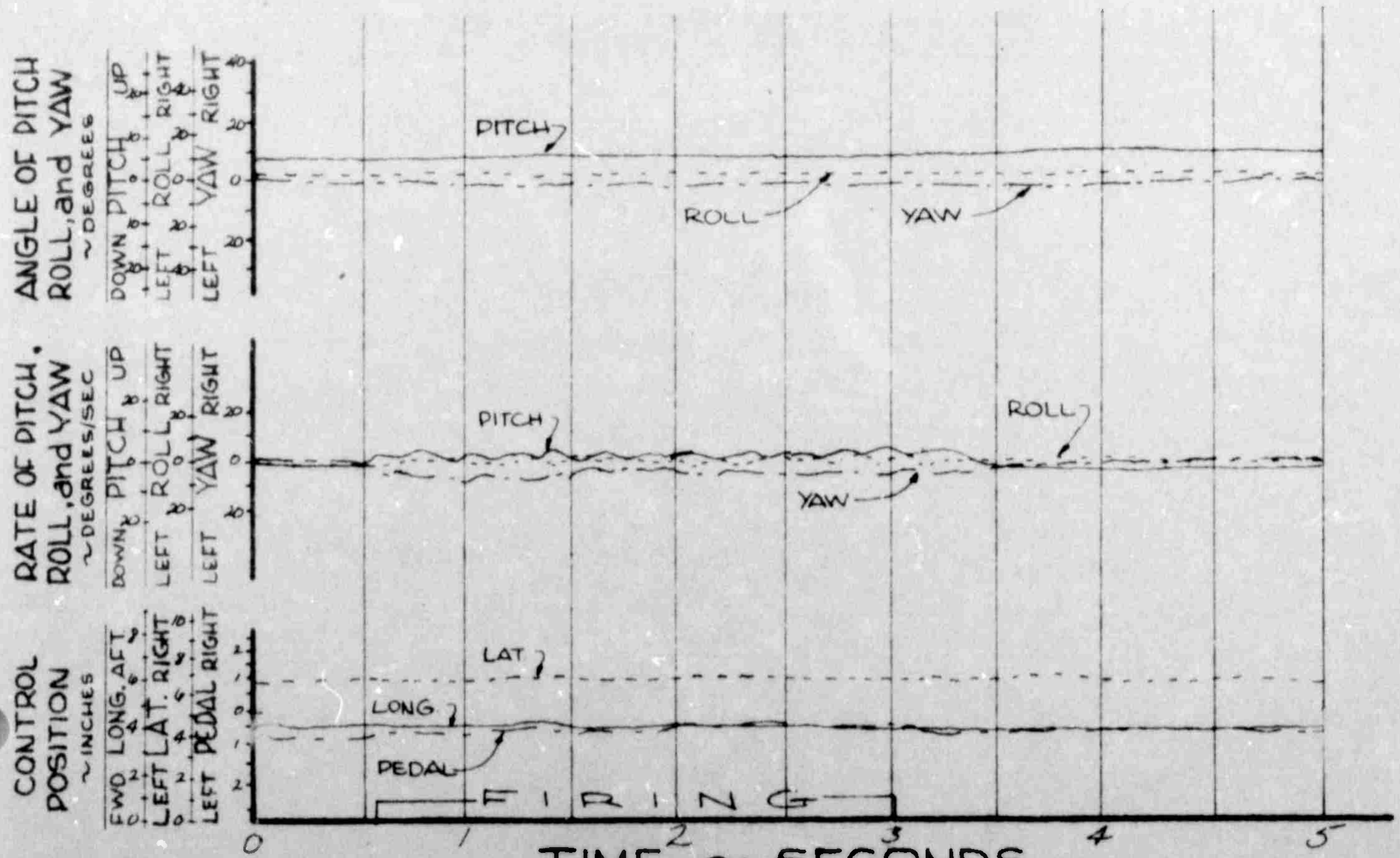
OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-8 (3.5° UP) (IN GROUND EFFECT)
AVERAGE GROSS WEIGHT: 2545 LBS.
LONG. C.G. LOCATION: 105.50 IN. (AFT)
LATERAL C.G. LOCATION: 1.05 IN. (LT.)

FLIGHT CONDITION: HOVER (SAE-ON)
TRIM CAS: ZERO
DENSITY ALTITUDE: 4120 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG. STICK
ROLL - - - - and LAT. STICK
YAW — - — - — and PEDAL

(CONTROLS FIXED)



FOR OFFICAL USE ONLY

FIGURE NO. 219

TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

(IN GROUND EFFECT)

CONFIGURATION: XM-8 (35° DOWN)
AVERAGE GROSS WEIGHT: 2550 LBS.
LONG. C.G. LOCATION: 105.55 IN. (AFT)
LATERAL C.G. LOCATION: 1.0 IN. (LT)

FLIGHT CONDITION: HOVER (SAE-OFF)
TRIM CAS: ZERO
DENSITY ALTITUDE: 4500 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG. STICK
ROLL - - - - and LAT. STICK
YAW — - — - — and PEDAL

(CONTROLS FIXED)

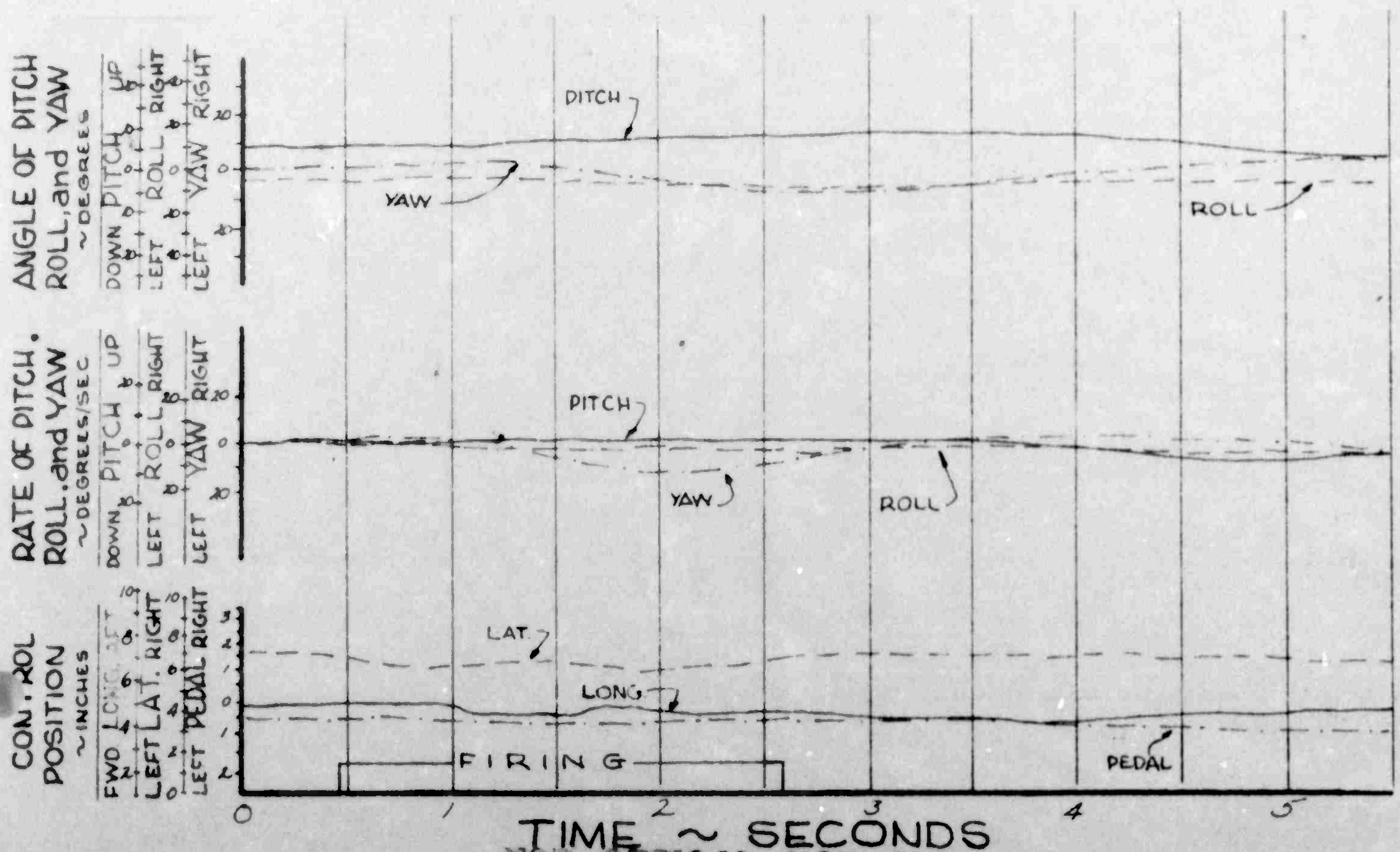


FIGURE NO. 220

TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

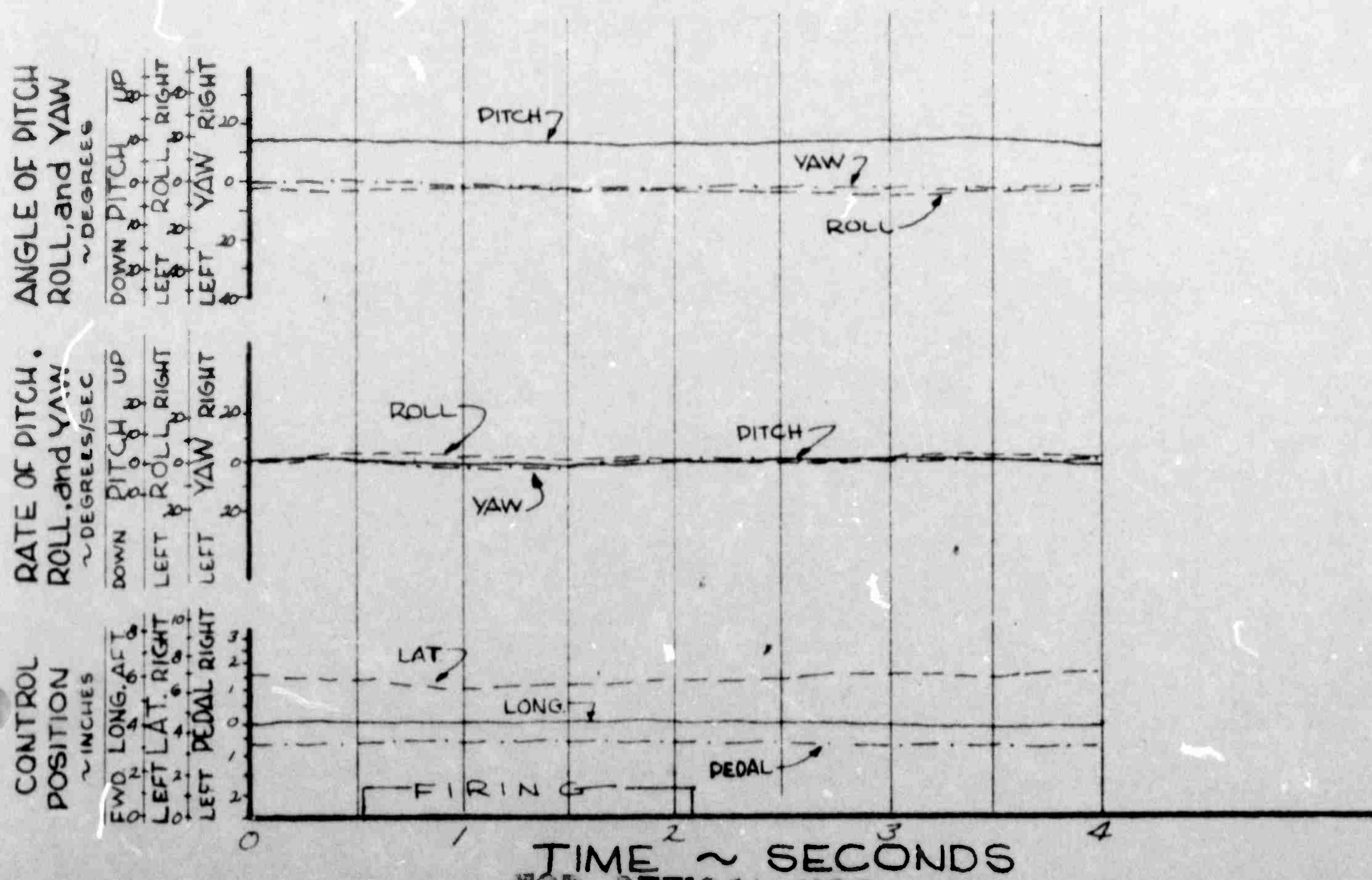
(IN GROUND EFFECT)

CONFIGURATION: XM-8 (35° DOWN)
AVERAGE GROSS WEIGHT: 2565 LBS.
LONG. C.G. LOCATION: 105.60 IN (AFT)
LATERAL C.G. LOCATION: 1.15 IN. (LT)

FLIGHT CONDITION: HOVER (SAE-ON)
TRIM CAS: ZERO
DENSITY ALTITUDE: 4500 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG STICK
ROLL - - - - and LAT. STICK
YAW — - — - and PEDAL

(CONTROLS FIXED)



FOR OFFICAL USE ONLY

FIGURE NO. 221

TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

(IN GROUND EFFECT)

CONFIGURATION: XM-8 (3.5° UP)
FLIGHT CONDITION: LEFT SIDEWARD (SAE-OFF)

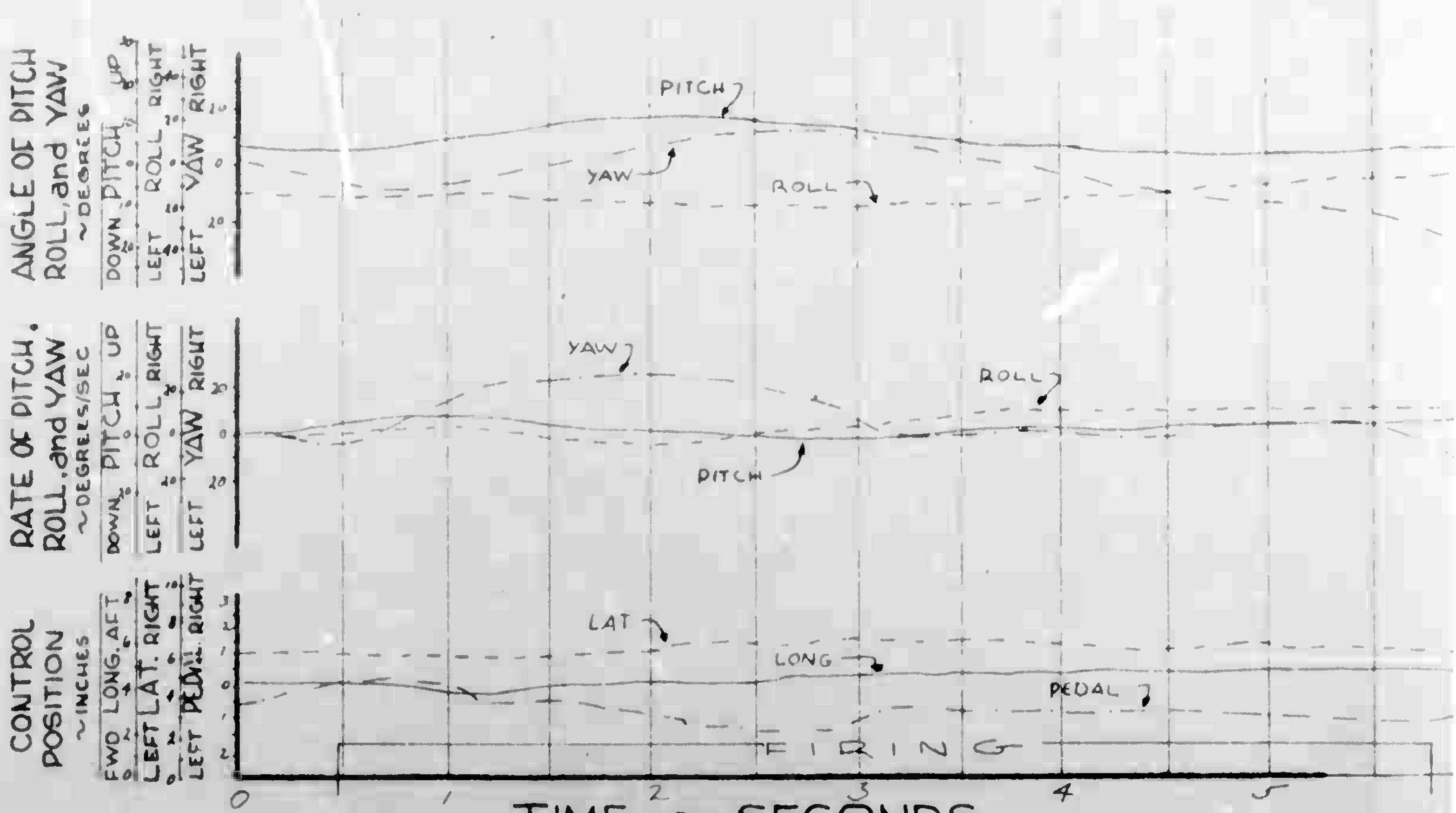
AVERAGE GROSS WEIGHT: 2525 LBS.
TRIM CAS: APPROX. 12 KNOTS (TRANSLATION)

LONG. C.G. LOCATION: 104.00 IN. (AFT)
DENSITY ALTITUDE: 3960 FEET

LATERAL C.G. LOCATION: 1.00 IN. (LT)
ROTOR SPEED: 394 RPM

PITCH ——— and LONG. STICK
ROLL - - - - and LAT. STICK
YAW — - — - and PEDAL

(PILOT HOLDING CONSTANT ATTITUDE)



FOR OFFICAL USE ONLY

FIGURE NO. 221

HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

URATION: XM-8 (3.5° UP) (IN GROUND EFFECT)
FLIGHT CONDITION: LEFT SIDEWARD (SAE-OFF)

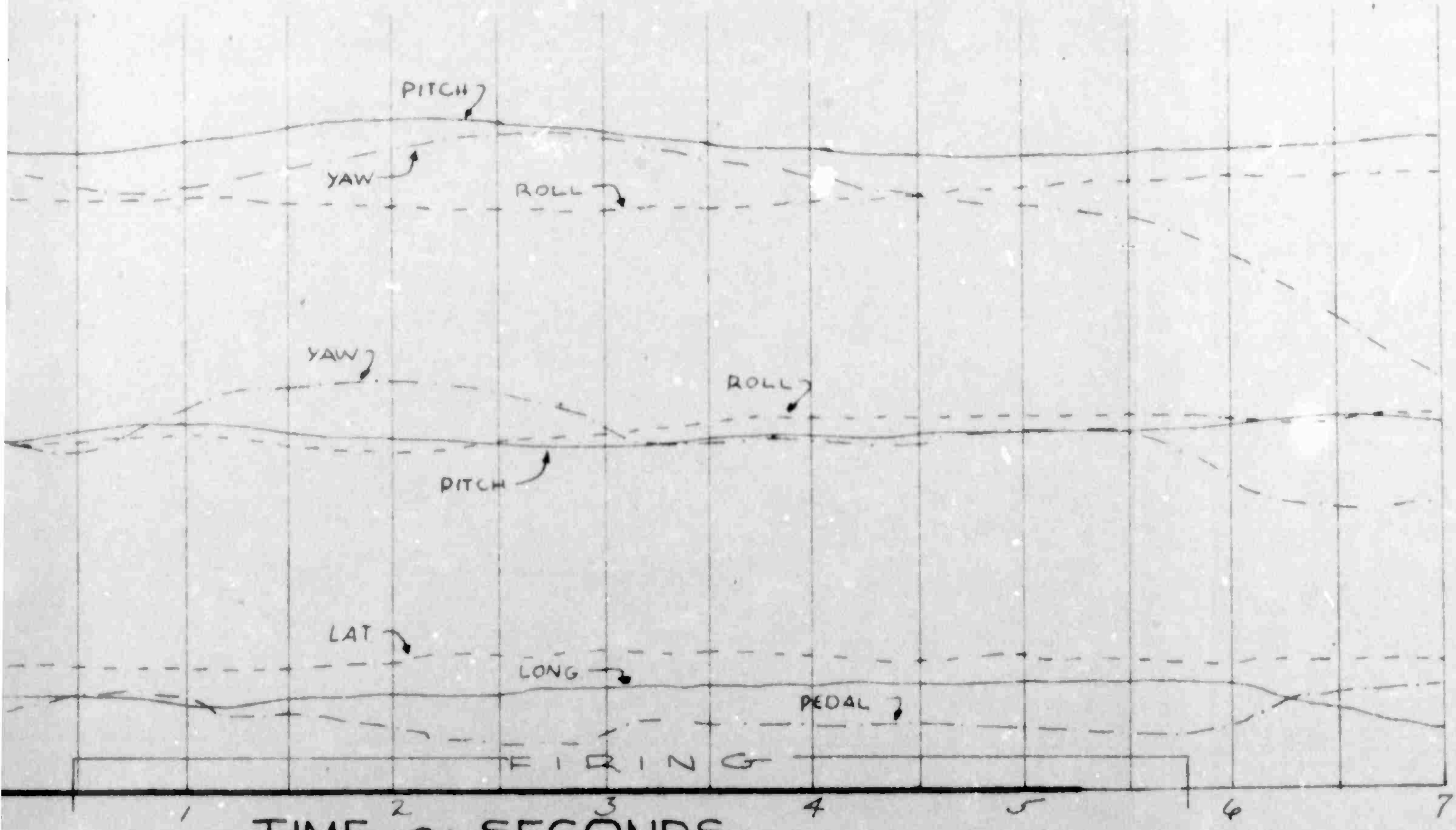
GE GROSS WEIGHT: 2525 LBS.
TRIM CAS: APPROX. 12 KNOTS (TRANSLATION)

.G. LOCATION: 104.00 IN. (AFT)
DENSITY ALTITUDE: 3960 FEET

AL C.G. LOCATION: 1.00 IN. (LT)
ROTOR SPEED: 394 RPM

——— IG. STICK   ROLL - - - - and LAT. STICK   YAW — - — - — and PEDAL

(PILOT HOLDING CONSTANT ATTITUDE)



FOR OFFICAL USE ONLY

FIGURE NO. 222

TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

(IN GROUND EFFECT)

CONFIGURATION: XM-8 (3.5° UP)
AVERAGE GROSS WEIGHT: 2515 LBS.
LONG. C.G. LOCATION: 105.40 IN. (AFT)
LATERAL C.G. LOCATION: .85 IN. (LT.)

FLIGHT CONDITION: LEFT SIDEWARD (SAE-ON)
TRIM CAS: APPROX. 12 KNOTS (TRANSLATION)
DENSITY ALTITUDE: 4120 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG. STICK
ROLL - - - - and LAT. STICK
YAW — - — - — and PEDAL

(PILOT HOLDING CONSTANT ATTITUDE)

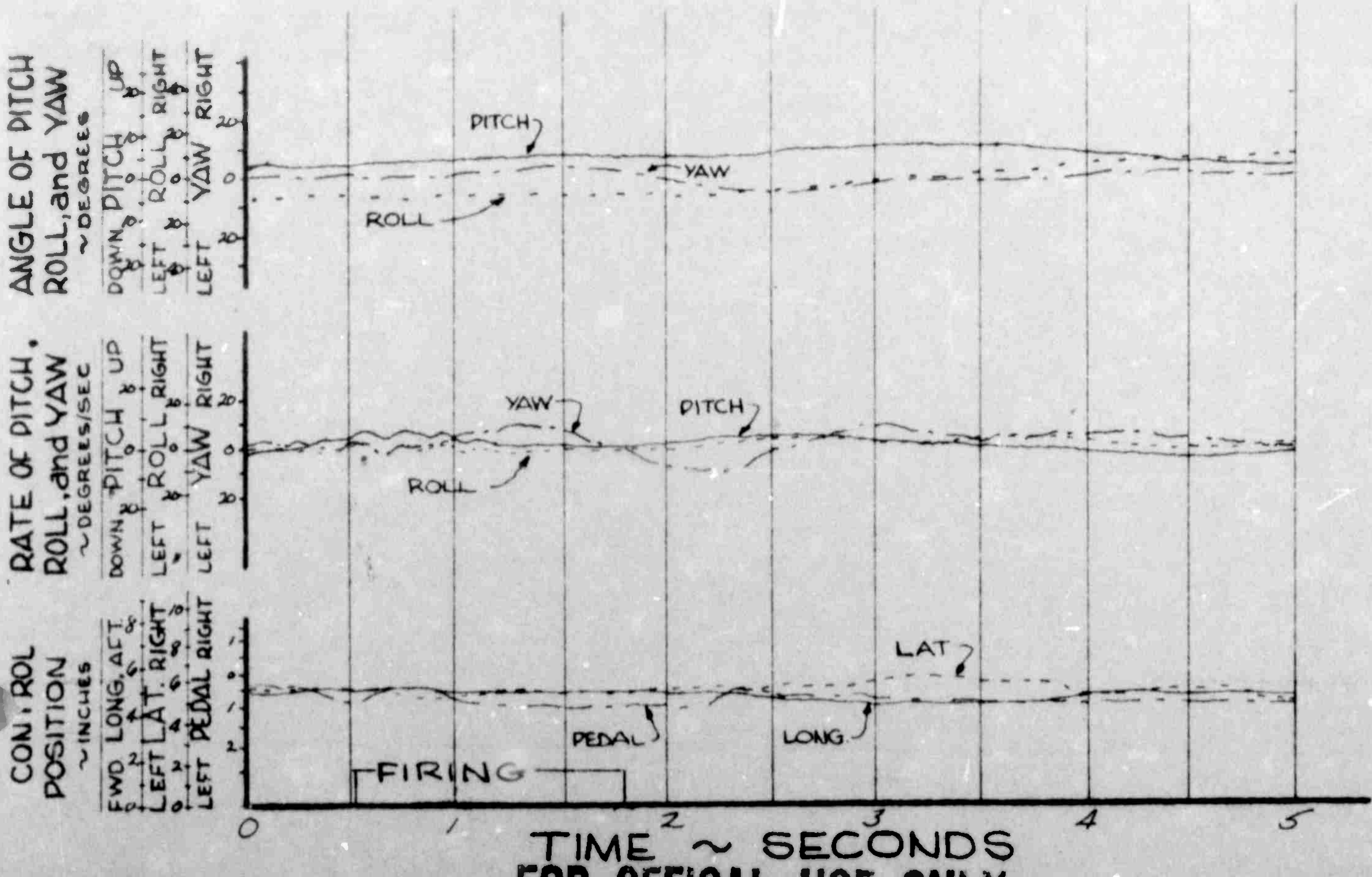


FIGURE NO. 223

TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

(IN GROUND EFFECT)

CONFIGURATION: XM-8 (35° DOWN).
AVERAGE GROSS WEIGHT: 2580 LBS.
LONG. C.G. LOCATION: 105.60 IN. (AFT)
LATERAL C.G. LOCATION: 1.15 IN. (LT.)

FLIGHT CONDITION: LEFT SIDEWARD (SAE-OFF)
TRIM CAS: APPROX. 12 KNOTS (TRANSLATION)
DENSITY ALTITUDE: 4710 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG. STICK
ROLL - - - - and LAT. STICK
YAW - - - - - and PEDAL

(PILOT HOLDING CONSTANT ATTITUDE)

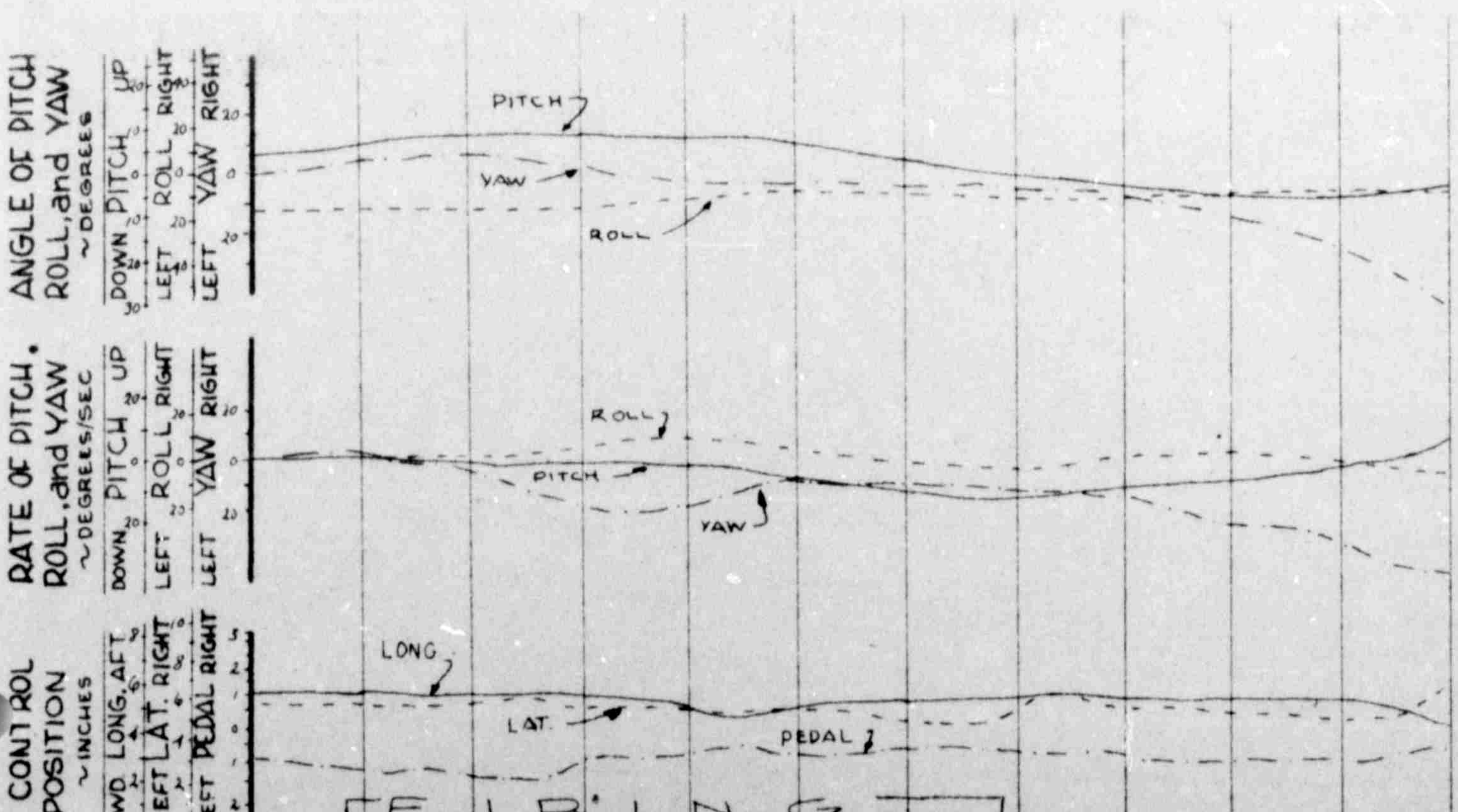


FIGURE NO. 224

TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

(IN GROUND EFFECT)

CONFIGURATION: XM-8 (35° DOWN)
AVERAGE GROSS WEIGHT: 2595 LBS
LONG. C.G. LOCATION: 105.60 IN. (LT.)
LATERAL C.G. LOCATION: 1.15 IN. (LT.)

FLIGHT CONDITION: LEFT SIDEWARD (SAE-ON)
TRIM CAS: APPROX. 12 KNOTS (TRANSLATION)
DENSITY ALTITUDE: 3860 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG. STICK
ROLL - - - - and LAT. STICK
YAW — - — - and PEDAL

(PILOT HOLDING CONSTANT ATTITUDE)

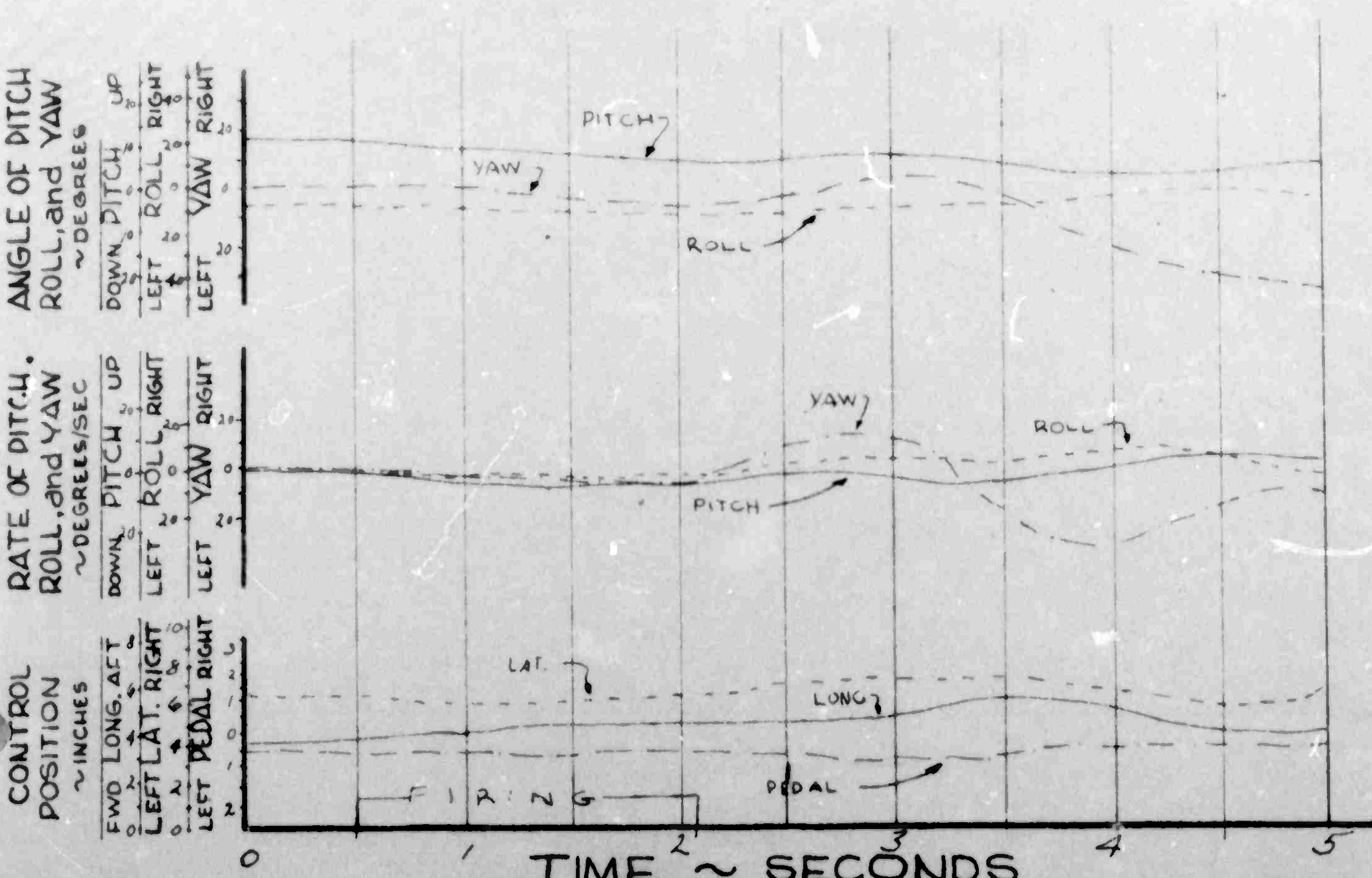


FIGURE NO. 225

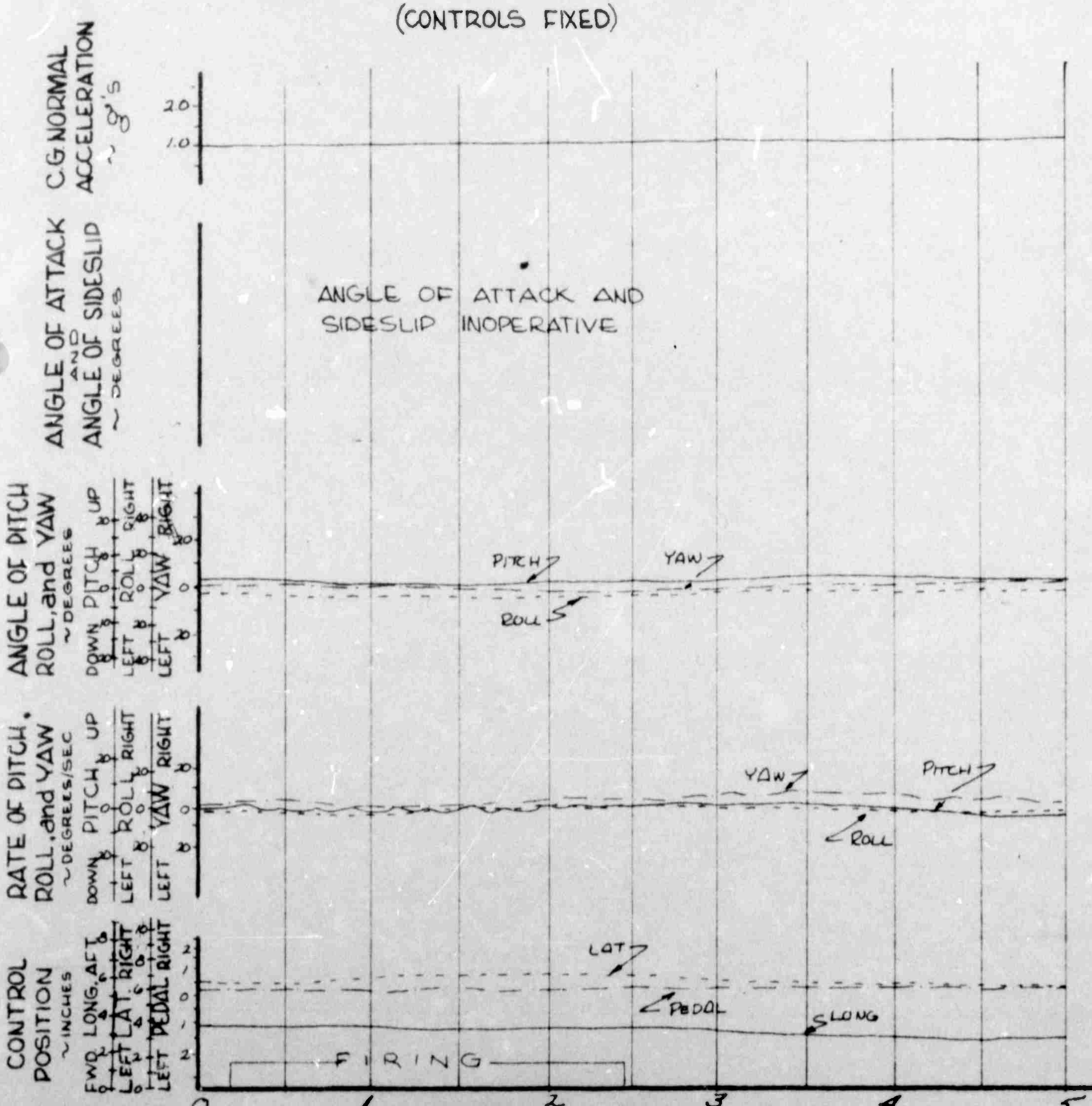
TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-8 (3.5° UP)
AVERAGE GROSS WEIGHT: 2550 LB
LONG. C.G. LOCATION: 105.55 IN (AFT)
LATERAL C.G. LOCATION: 1.10 IN (LT)

FLIGHT CONDITION: LEVEL FLIGHT (SAE-OFF)
TRIM CAS: 35 KNOTS
DENSITY ALTITUDE: 5620 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG. STICK
ROLL - - - - and LAT. STICK
YAW — - — - — and PEDAL
(CONTROLS FIXED)



TIME ~ SECONDS

FOR OFFICIAL USE ONLY

FIGURE NO. 226

TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-8 (3.5° UP)
AVERAGE GROSS WEIGHT: 2555 LBS.
LONG. C.G. LOCATION: 105.55 IN. (AFT)
LATERAL C.G. LOCATION: 1.10 IN. (LT.)

FLIGHT CONDITION: LEVEL FLIGHT (SAE-ON)
TRIM CAS: 35 KNOTS
DENSITY ALTITUDE: 5620 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG. STICK
ROLL - - - - and LAT. STICK (CONTROLS FIXED)
YAW — - — - — and PEDAL

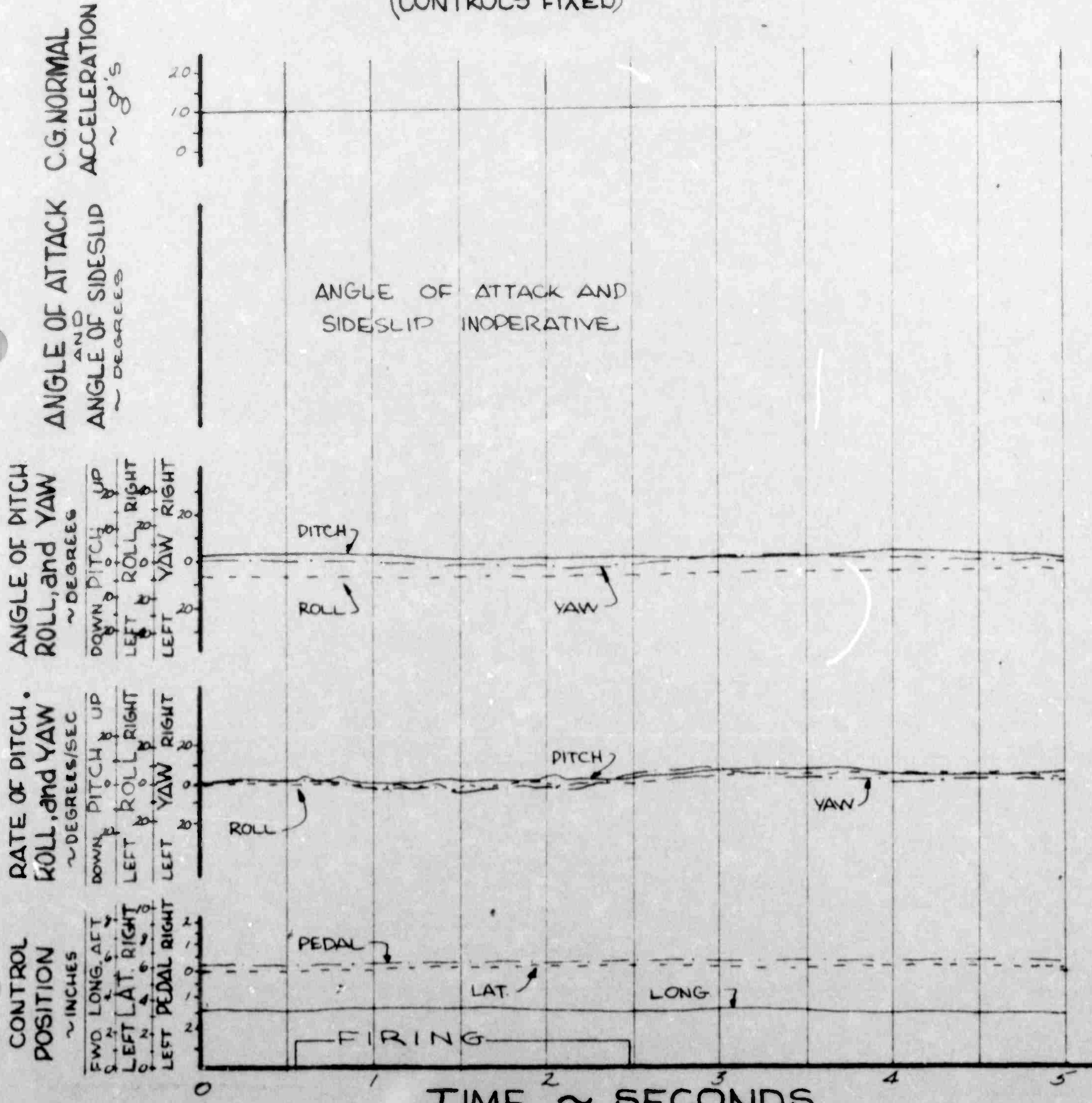


FIGURE NO. 22

TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-8 (35° DOWN)
AVERAGE GROSS WEIGHT: 2570 LBS.
LONG. C.G. LOCATION: 105.55 IN. (AFT)
LATERAL C.G. LOCATION: 1.10 IN (LT)

FLIGHT CONDITION: LEVEL FLIGHT (SAE-OFF)
TRIM CAS: 35 KNOTS
DENSITY ALTITUDE: 5050 FEET
ROTOR SPEED: 394 RPM

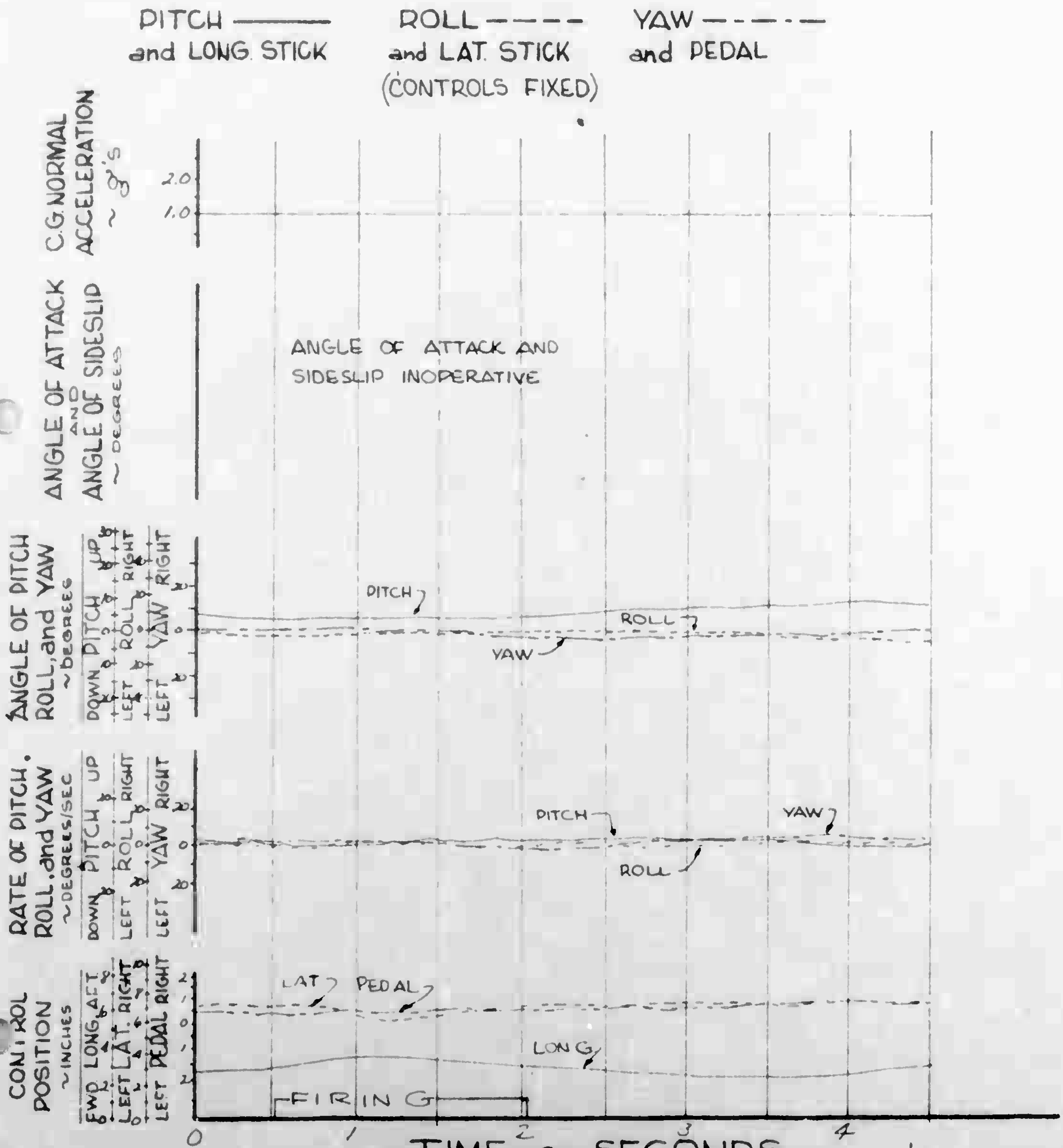


FIGURE NO. 22

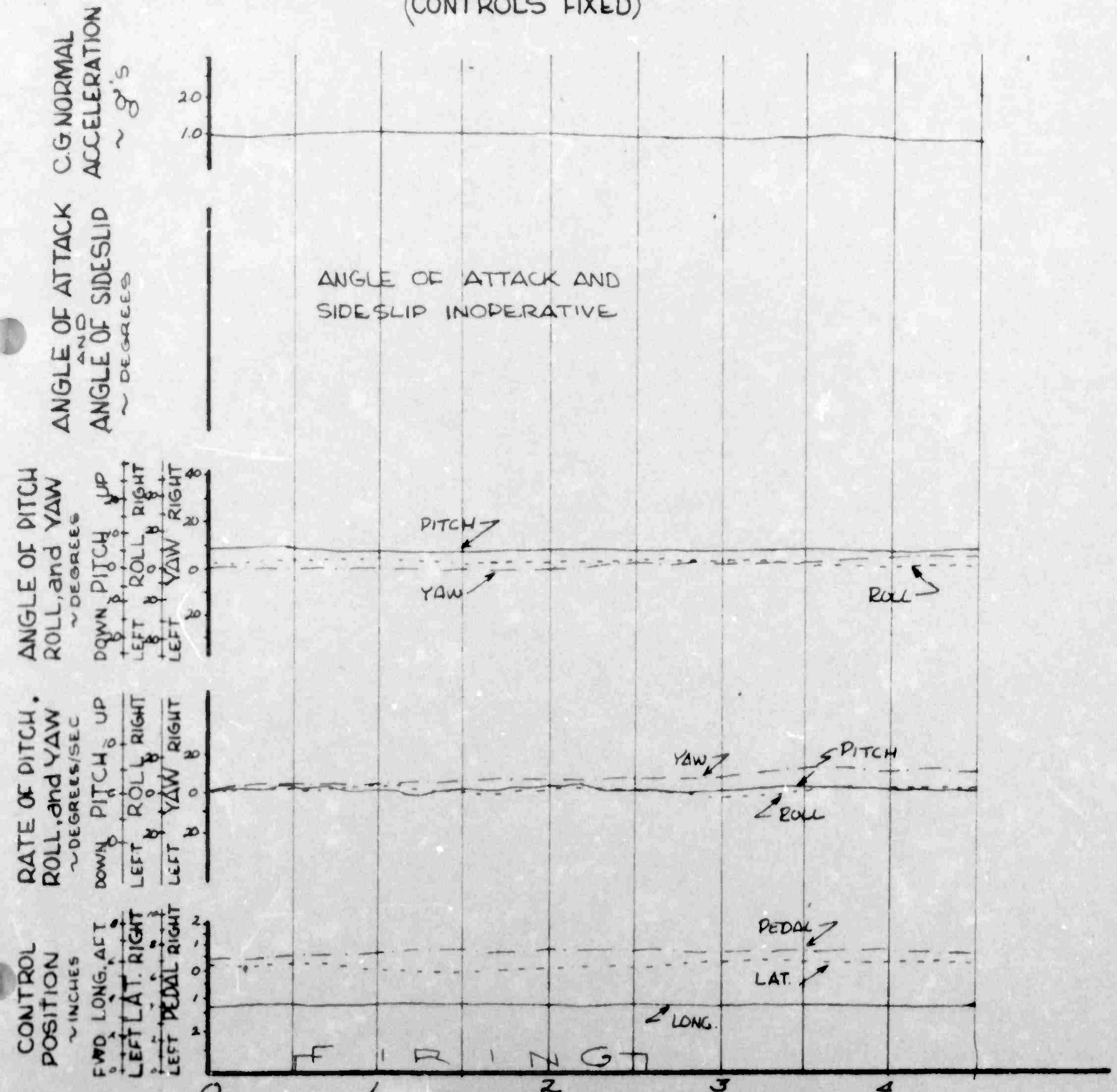
TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-8 (35° DOWN)
AVERAGE GROSS WEIGHT: 2580 LB.
LONG. C.G. LOCATION: 105.80 IN. (AFT)
LATERAL C.G. LOCATION: 1.15 IN. (LT)

FLIGHT CONDITION: LEVEL FLIGHT (SAE-ON)
TRIM CAS: 35 KNOTS
DENSITY ALTITUDE: 5050 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG. STICK
ROLL - - - - and LAT. STICK
YAW — - — - and PEDAL
(CONTROLS FIXED)



FOR OFFICAL USE ONLY

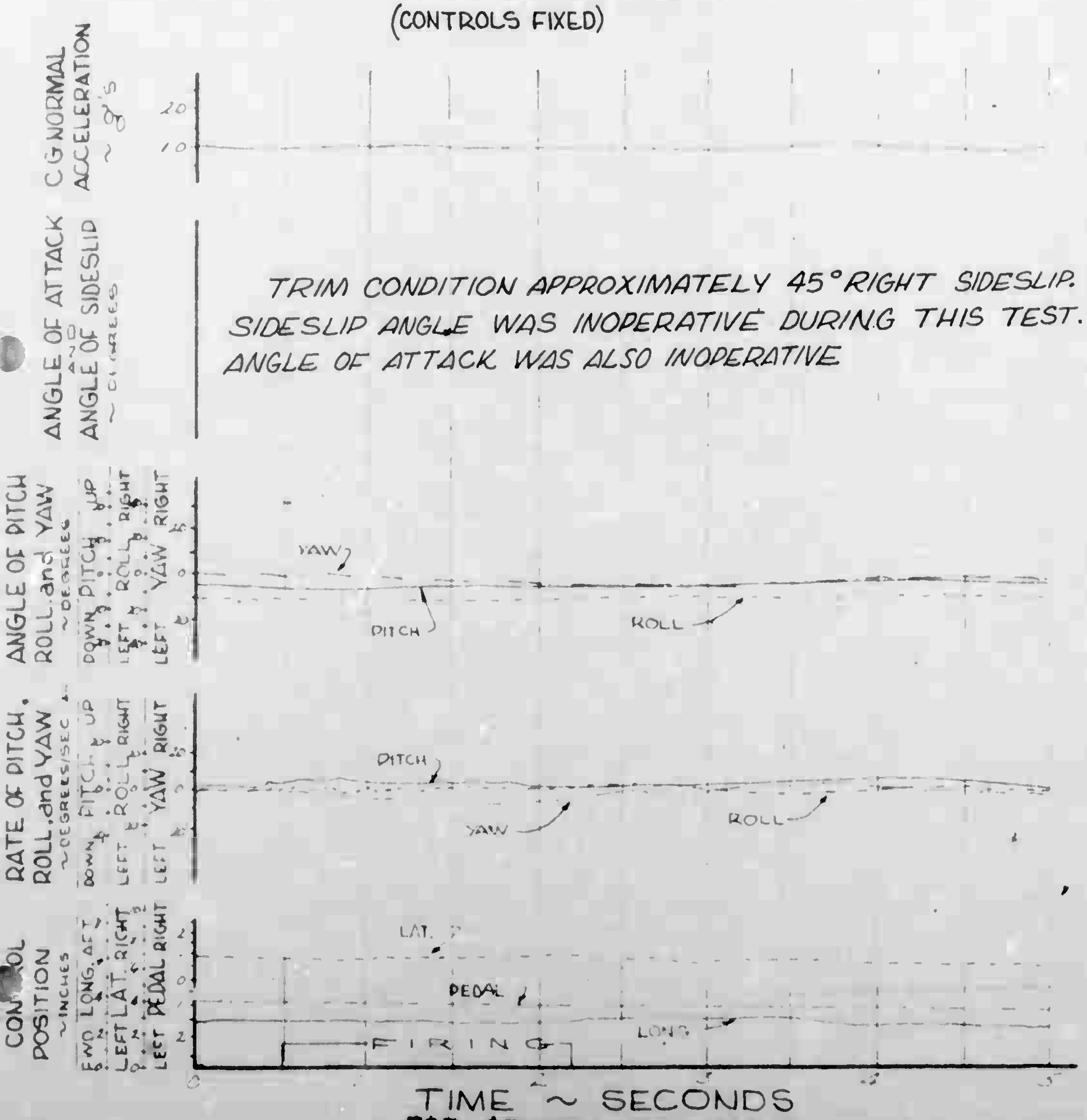
TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-8 (3.5° UP)
AVERAGE GROSS WEIGHT: 2560 LBS
LONG C.G. LOCATION: 105.60 IN (AFT)
LATERAL C.G. LOCATION: 1.15 IN (LT)

FLIGHT CONDITION: RIGHT SIDESLIP (SAE-OFF)
TRIM CAS: 35 KNOTS
DENSITY ALTITUDE: 5620 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG STICK
ROLL - - - - and LAT STICK (CONTROLS FIXED)
YAW — - — - — and PEDAL



FOR OFFICAL USE ONLY

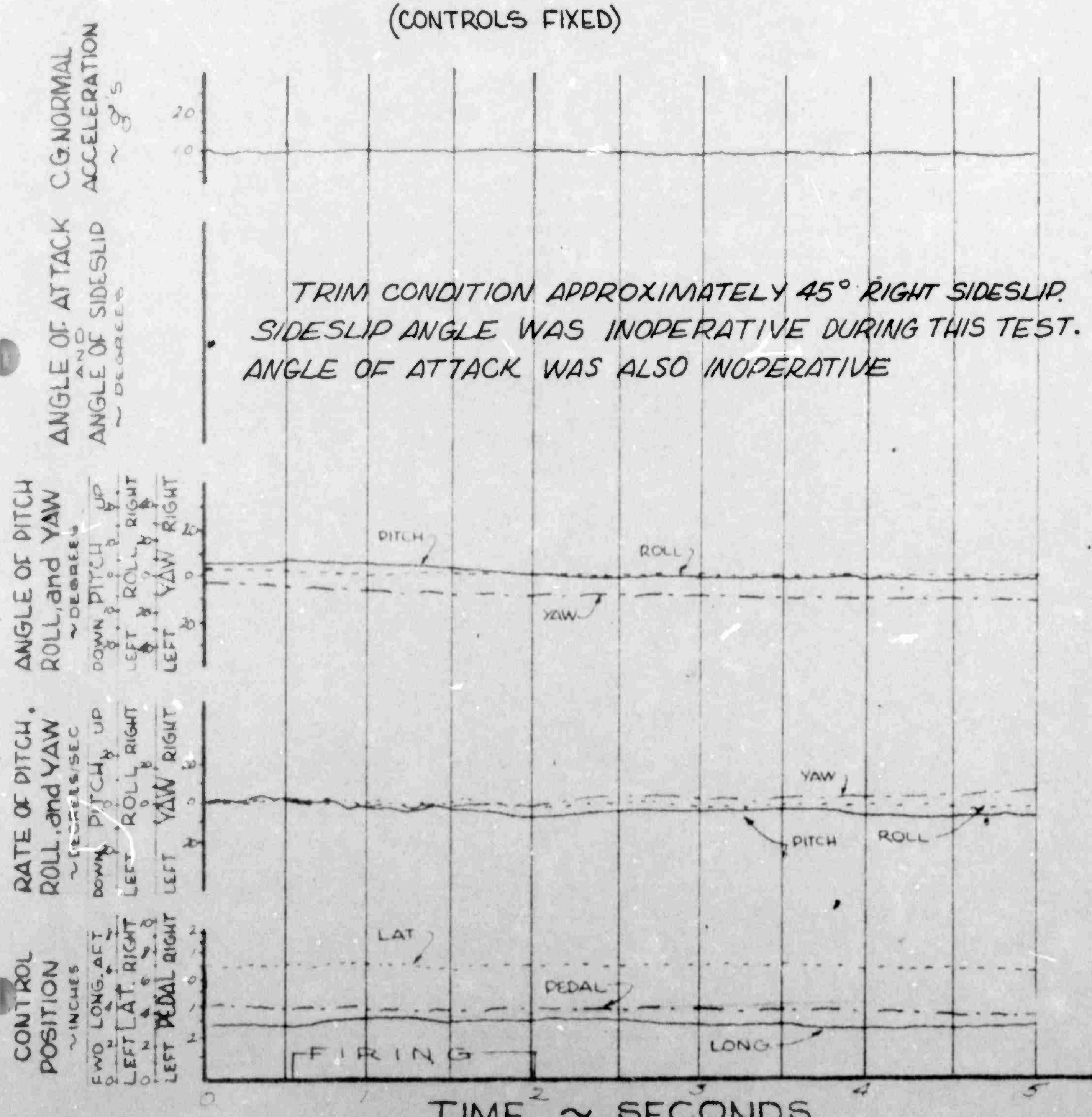
TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-8 (3.5° UP)
AVERAGE GROSS WEIGHT: 2590 LBS
LONG C.G. LOCATION: 105.60 IN (AFT)
LATERAL C.G. LOCATION: 1.14 IN (LT)

FLIGHT CONDITION: RIGHT SIDESLIP (SAE ON)
TRIM CAS: 35 KNOTS
DENSITY ALTITUDE: 5060 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG STICK
ROLL - - - - and LAT STICK
(CONTROLS FIXED)
YAW — - — - — and PEDAL



FOR OFFICAL USE ONLY

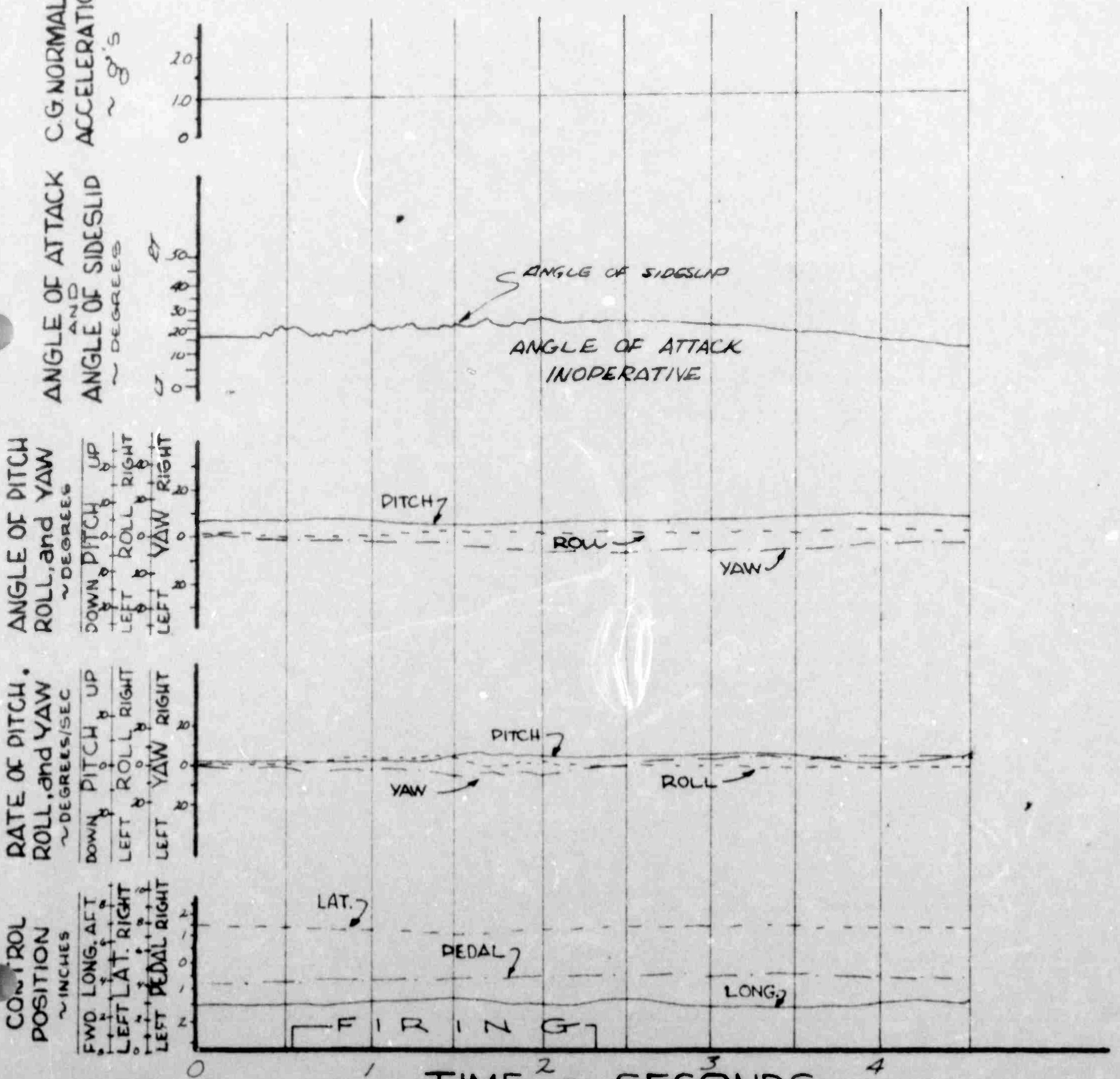
TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-8 (35° DOWN)
AVERAGE GROSS WEIGHT: 2570 LBS.
LONG. C.G. LOCATION: 105.55 IN. (AFT)
LATERAL C.G. LOCATION: 1.10 IN. (LT.)

FLIGHT CONDITION: RIGHT SIDESLIP (SAE-OFF)
TRIM CAS: 35 KNOTS
DENSITY ALTITUDE: 5060 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG. STICK
ROLL - - - - and LAT. STICK (CONTROLS FIXED)
YAW — - — - — and PEDAL



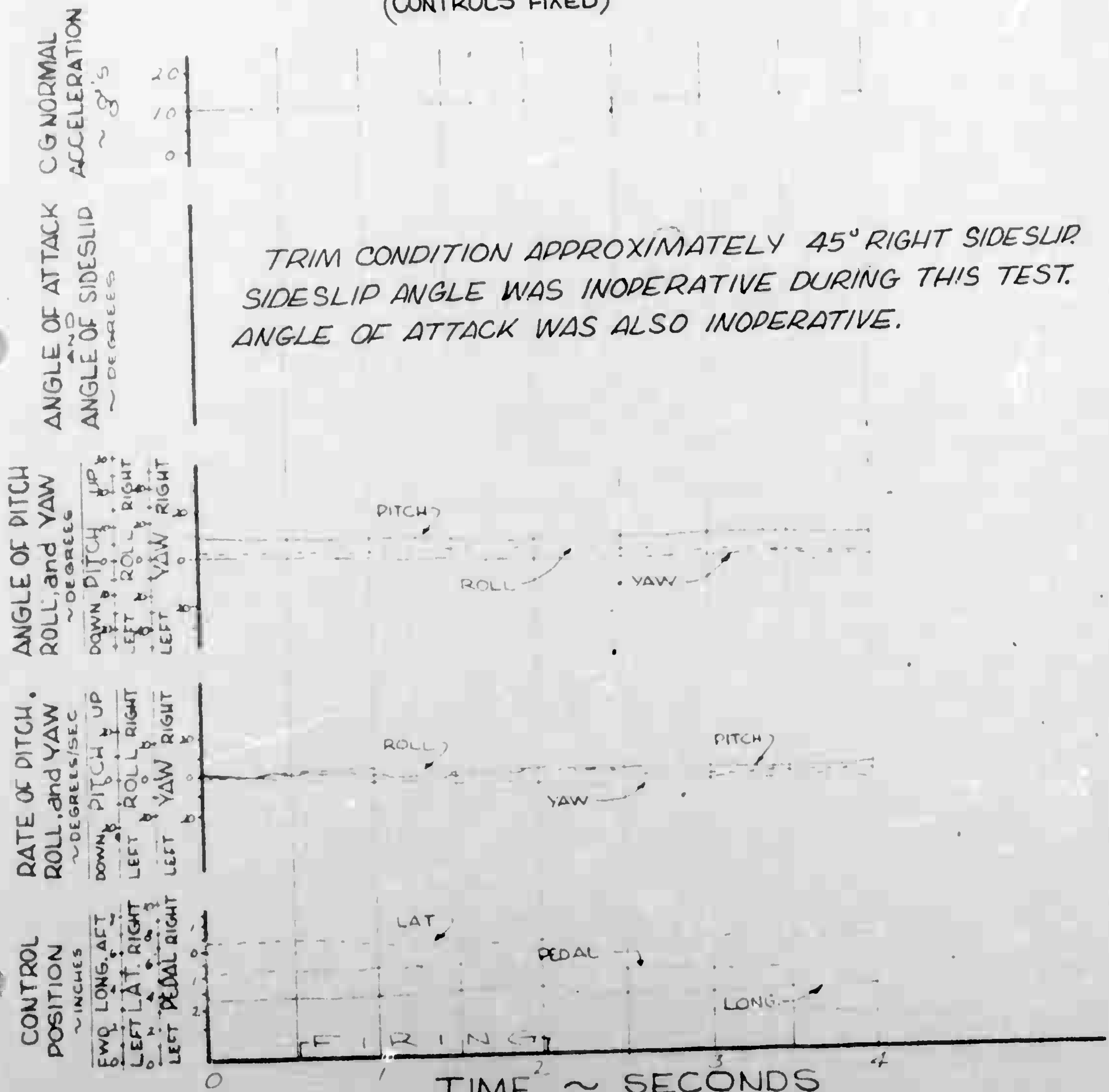
FOR OFFICAL USE ONLY

TIME HISTORY OF ARMAMENT FIRING
OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-8 (35° DOWN)
AVERAGE GROSS WEIGHT: 2565 LBS
LONG C.G. LOCATION: 105.55 IN. (AFT)
LATERAL C.G. LOCATION: 1.05 IN (LT)

FLIGHT CONDITION: RIGHT SIDESLIP (SAS-ON)
TRIM CAS: 35 KNOTS
DENSITY ALTITUDE: 5060 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG STICK
ROLL ---- and LAT. STICK
YAW —-—- and PEDAL
(CONTROLS FIXED)

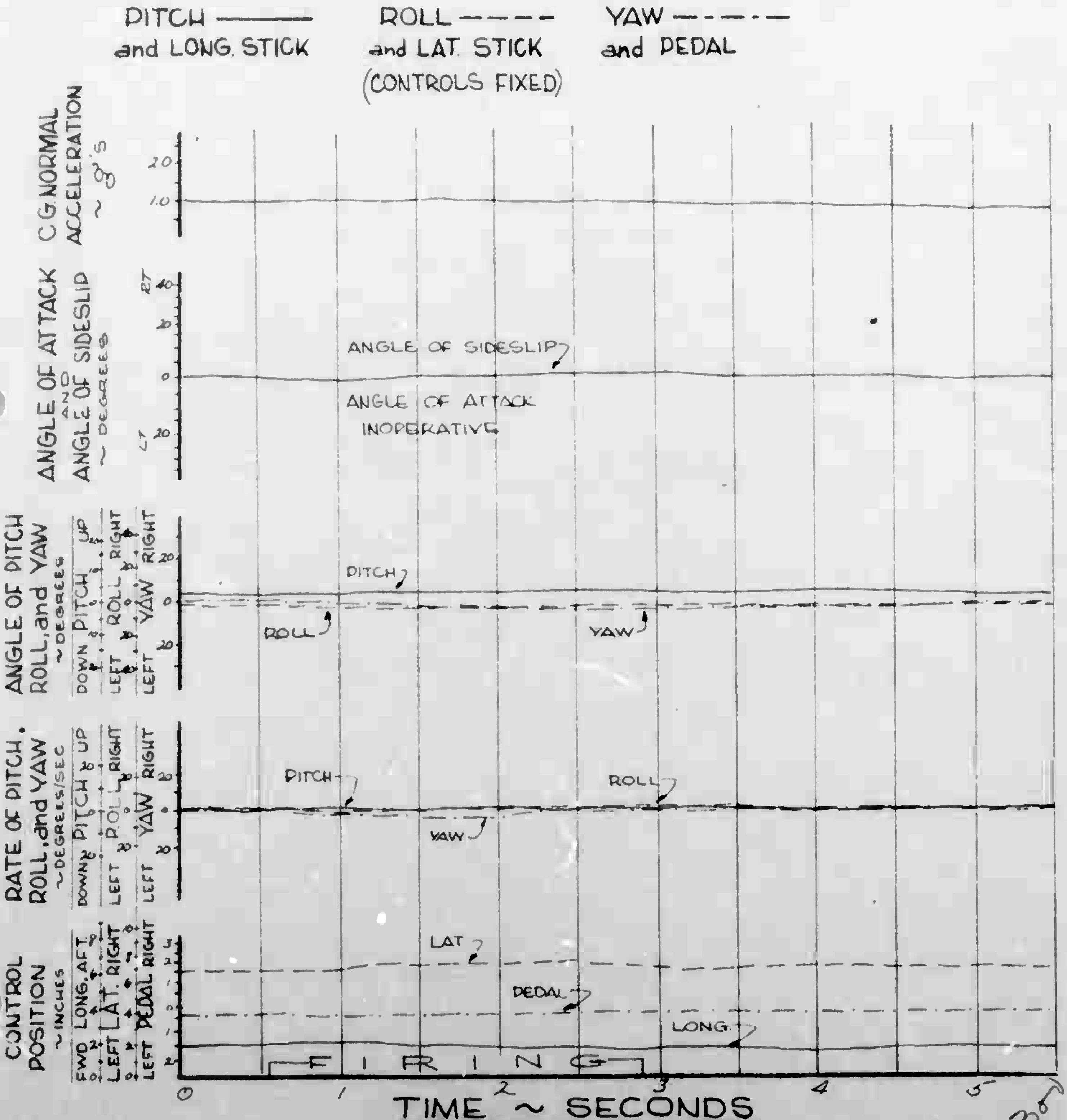


TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-8 (3.5° UP)
AVERAGE GROSS WEIGHT: 2570 LBS.
LONG. C.G. LOCATION: 105.55 IN. (AFT)
LATERAL C.G. LOCATION: 1.10 IN. (LT.)

FLIGHT CONDITION: SLIGHT DIVE (SAE-OFF)
TRIM CAS: 105.5 KNOTS
DENSITY ALTITUDE: 5590 FEET
ROTOR SPEED: 394 RPM



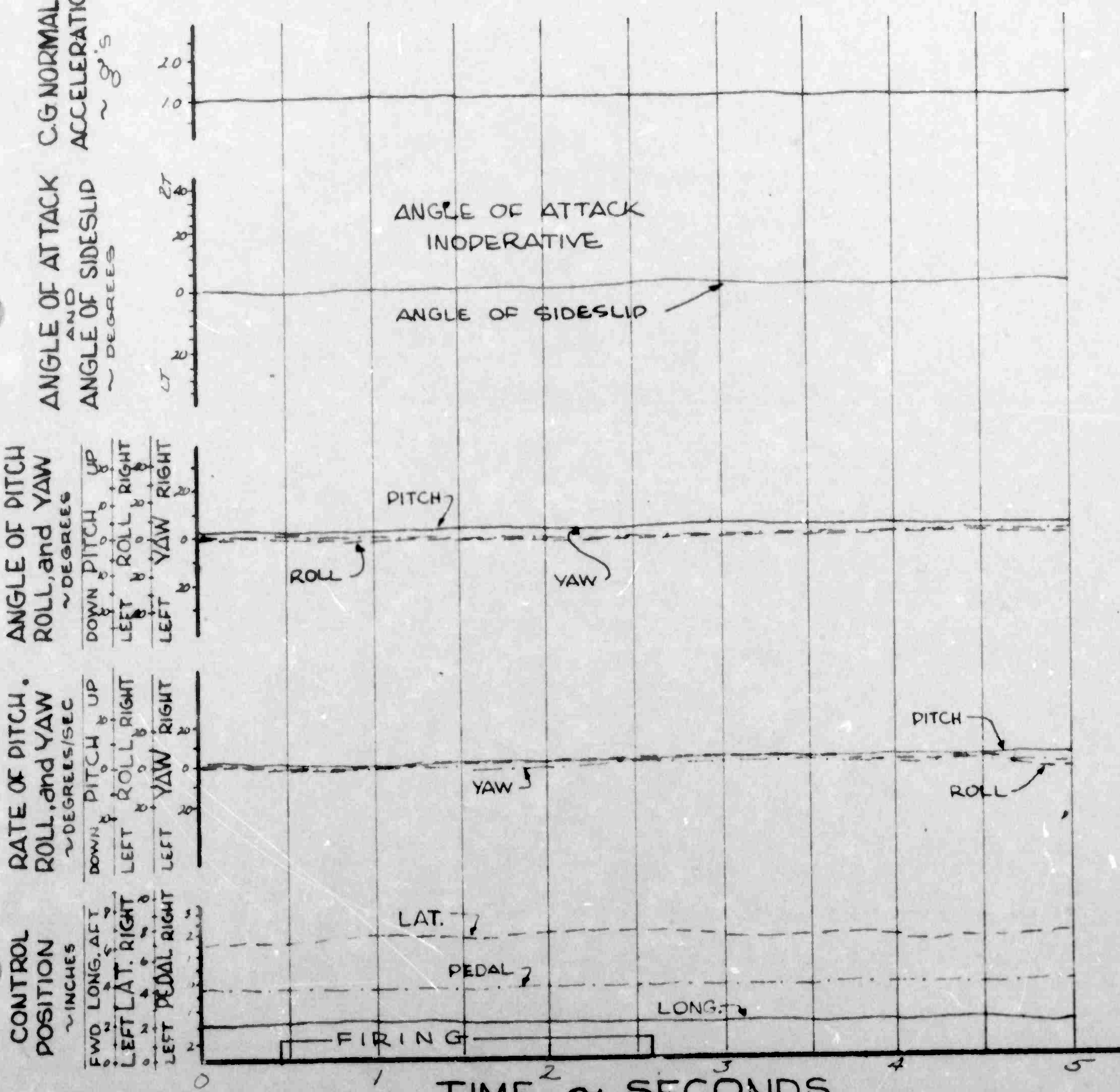
TIME HISTORY OF ARMAMENT FIRING
OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-8 (3.5° UP)
AVERAGE GROSS WEIGHT: 2585 LBS.
LONG. C.G. LOCATION: 105.60 IN (AFT)
LATERAL C.G. LOCATION: 1.15 IN. (LT.)

FLIGHT CONDITION: SLIGHT DIVE (SAE-ON)
TRIM CAS: 105.5 KNOTS
DENSITY ALTITUDE: 5590 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG. STICK
ROLL - - - - and LAT. STICK
YAW — - — - and PEDAL

(CONTROLS FIXED)



TIME ~ SECONDS

FOR OFFICAL USE ONLY

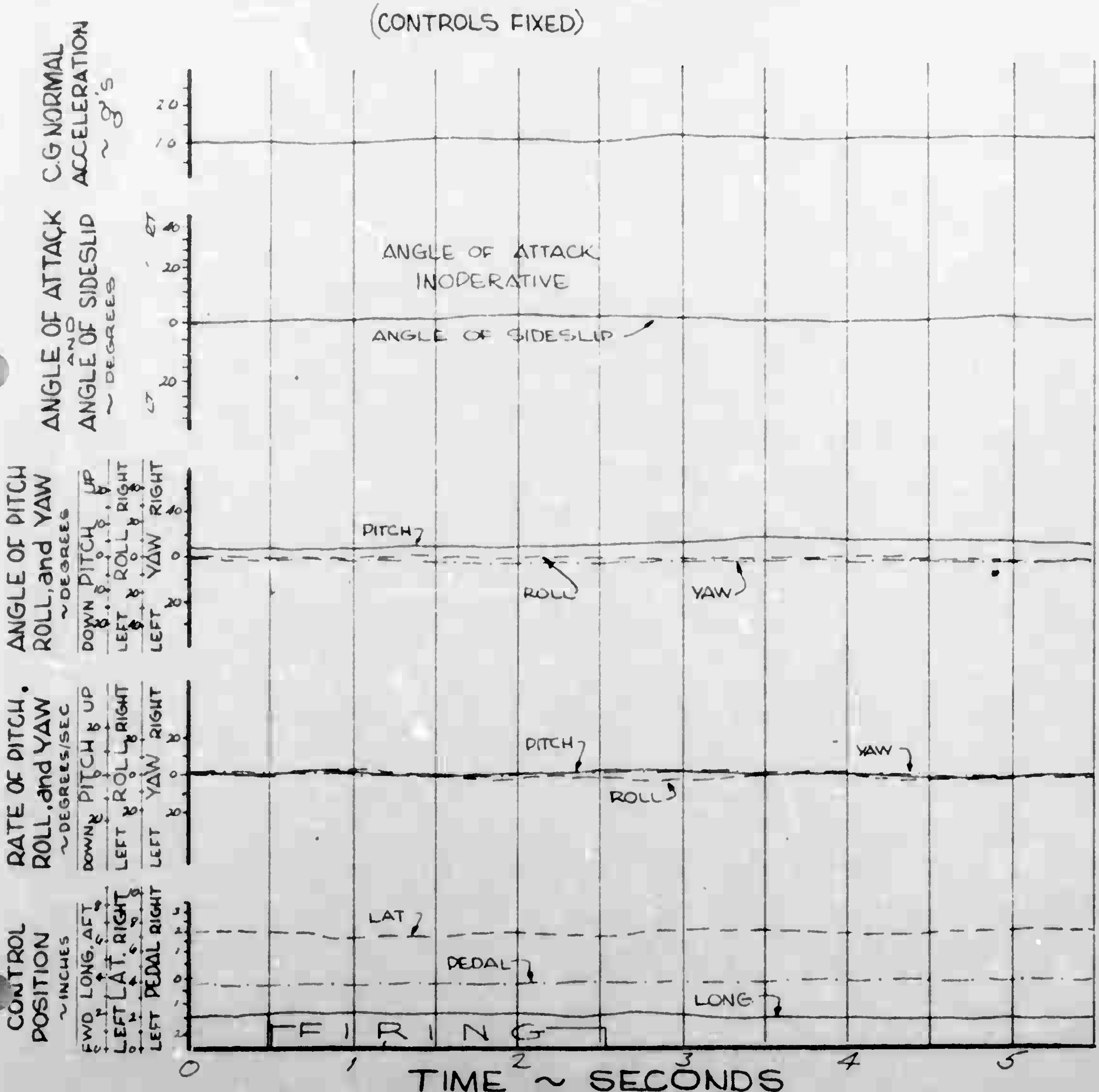
OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-8 (35° DOWN)
AVERAGE GROSS WEIGHT: 2560 LBS.
LONG. C.G. LOCATION: 105.55 IN. (AFT)
LATERAL C.G. LOCATION: 1.05 IN. (LT.)

FLIGHT CONDITION: SLIGHT DIVE (SAE-OFF)
TRIM CAS: 105.5 KNOTS
DENSITY ALTITUDE: 5590 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG. STICK
ROLL - - - - and LAT. STICK
YAW — - — - and PEDAL

(CONTROLS FIXED)



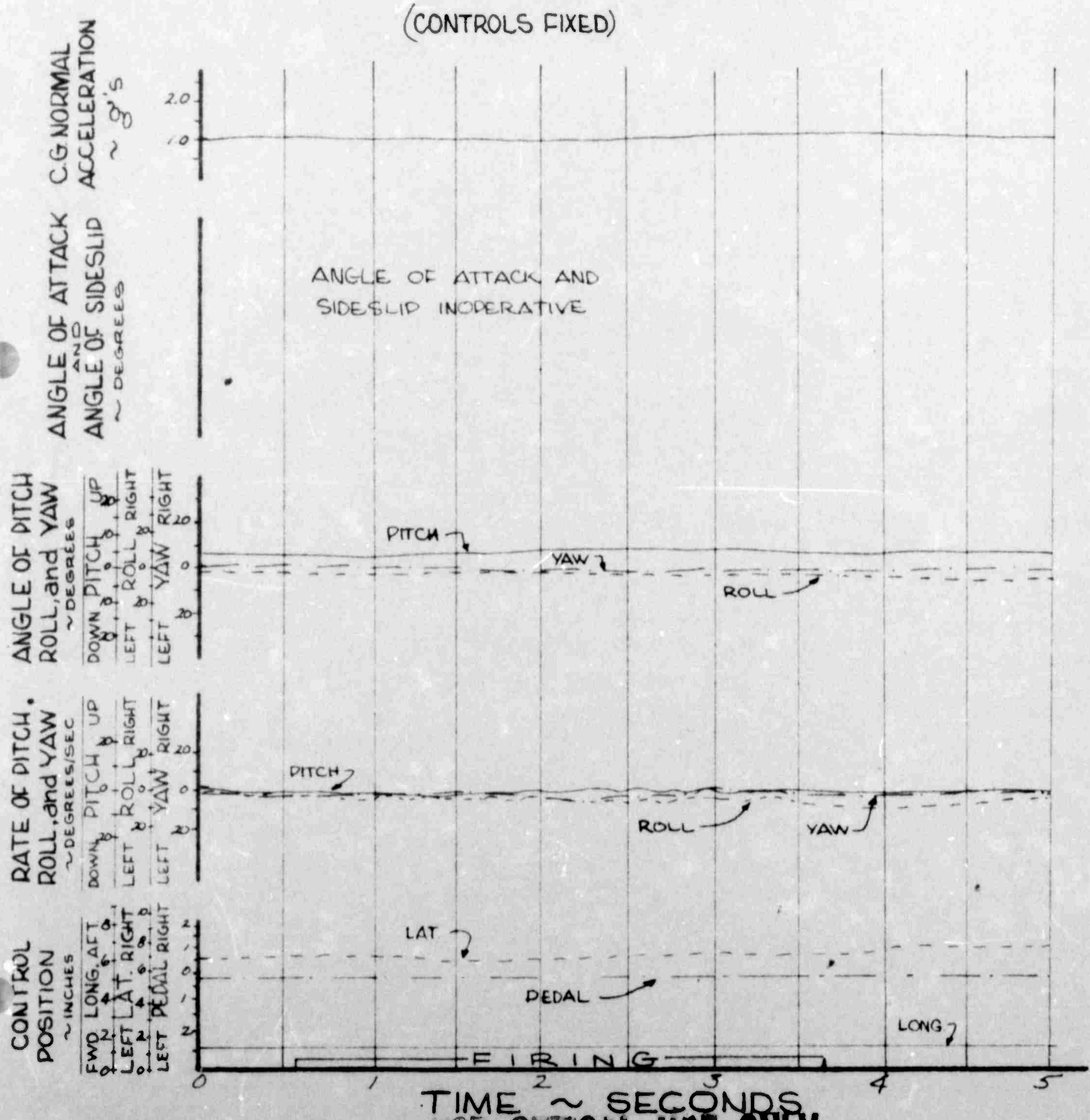
OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-8 (35° DOWN)
AVERAGE GROSS WEIGHT: 2525 LBS.
LONG. C.G. LOCATION: 105.50 IN. (AFT)
LATERAL C.G. LOCATION: 1.05 IN. (LT)

FLIGHT CONDITION: SLIGHT DIVE (SAE-ON)
TRIM CAS: 105.5 KNOTS
DENSITY ALTITUDE: 5620 FEET
ROTOR SPEED: 394 RPM

PITCH and LONG. STICK — ROLL and LAT. STICK — YAW and PEDAL

(CONTROLS FIXED)



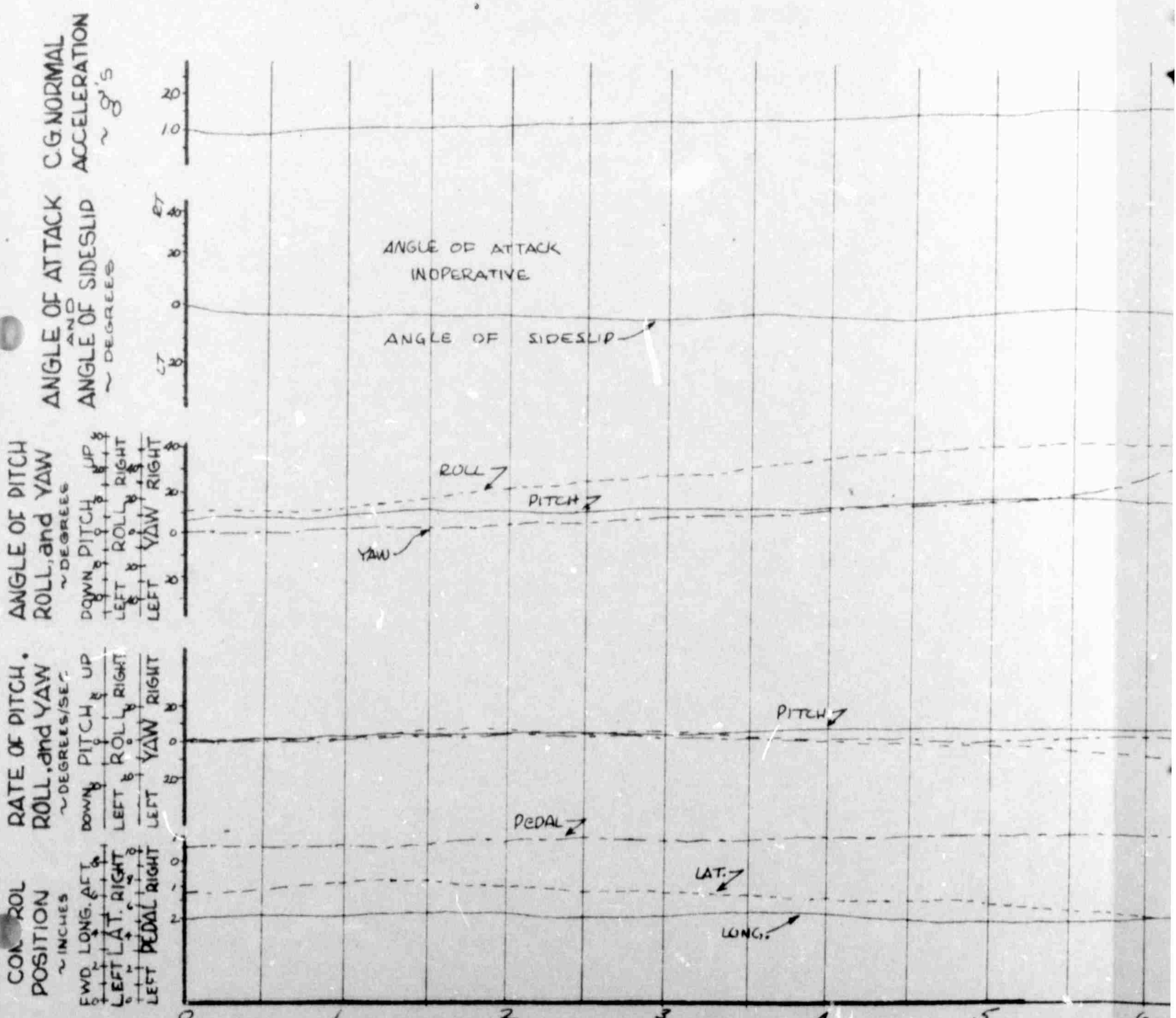
FOR OFFICAL USE ONLY

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-8 (3.5° UP)
AVERAGE GROSS WEIGHT: 2570 LBS.
LONG. C.G. LOCATION: 105.45 IN. (AFT)
LATERAL C.G. LOCATION: 1.05 IN. (LT.)

FLIGHT CONDITION: RT ROLLING PULL UP (SAE ON)
TRIM CAS: 92 KNOTS
DENSITY ALTITUDE: 5710 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG. STICK
ROLL - - - - and LAT. STICK
YAW — - — - — and PEDAL



FOR OFFICAL USE ONLY

(SAE ON)

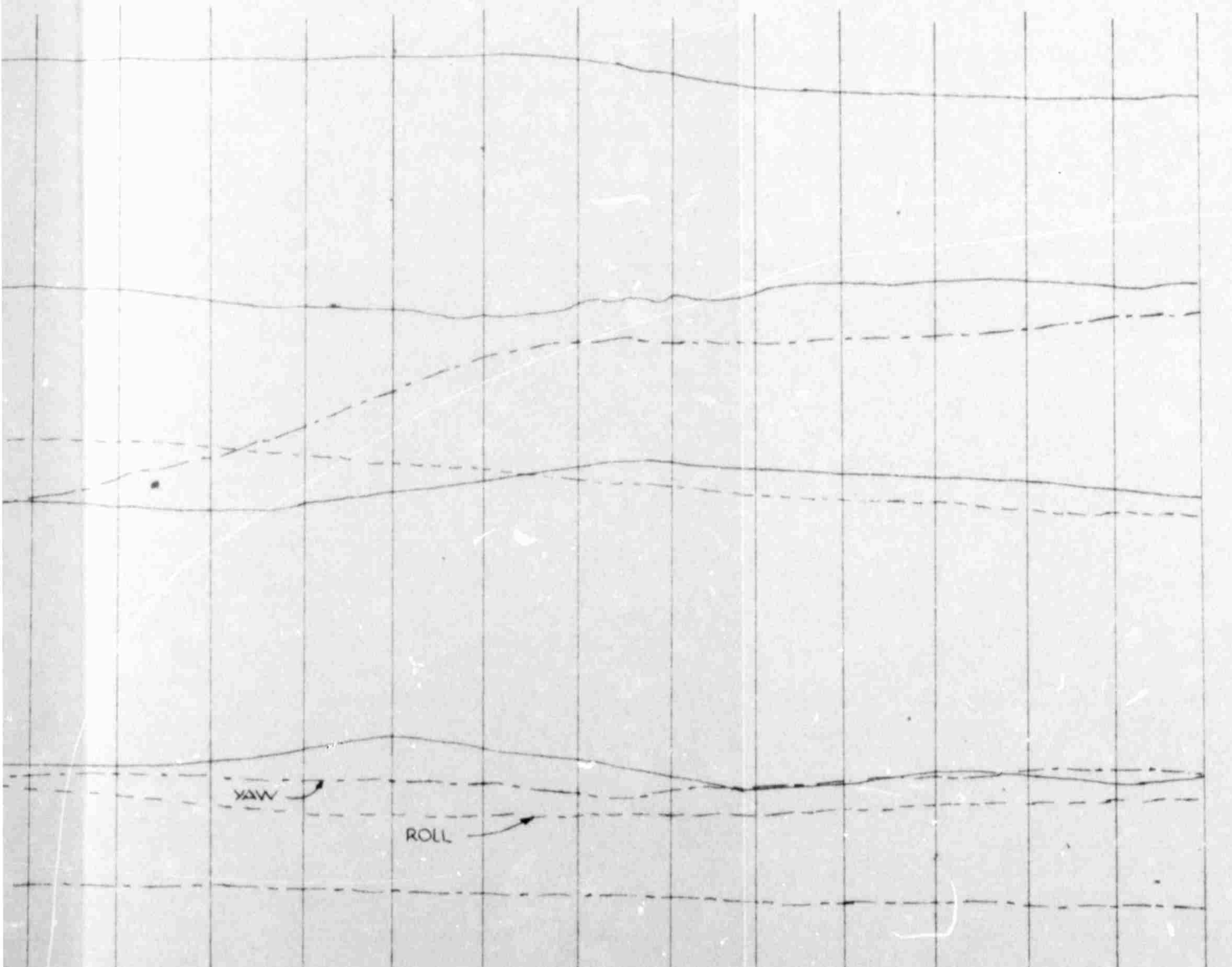


FIGURE NO. 238

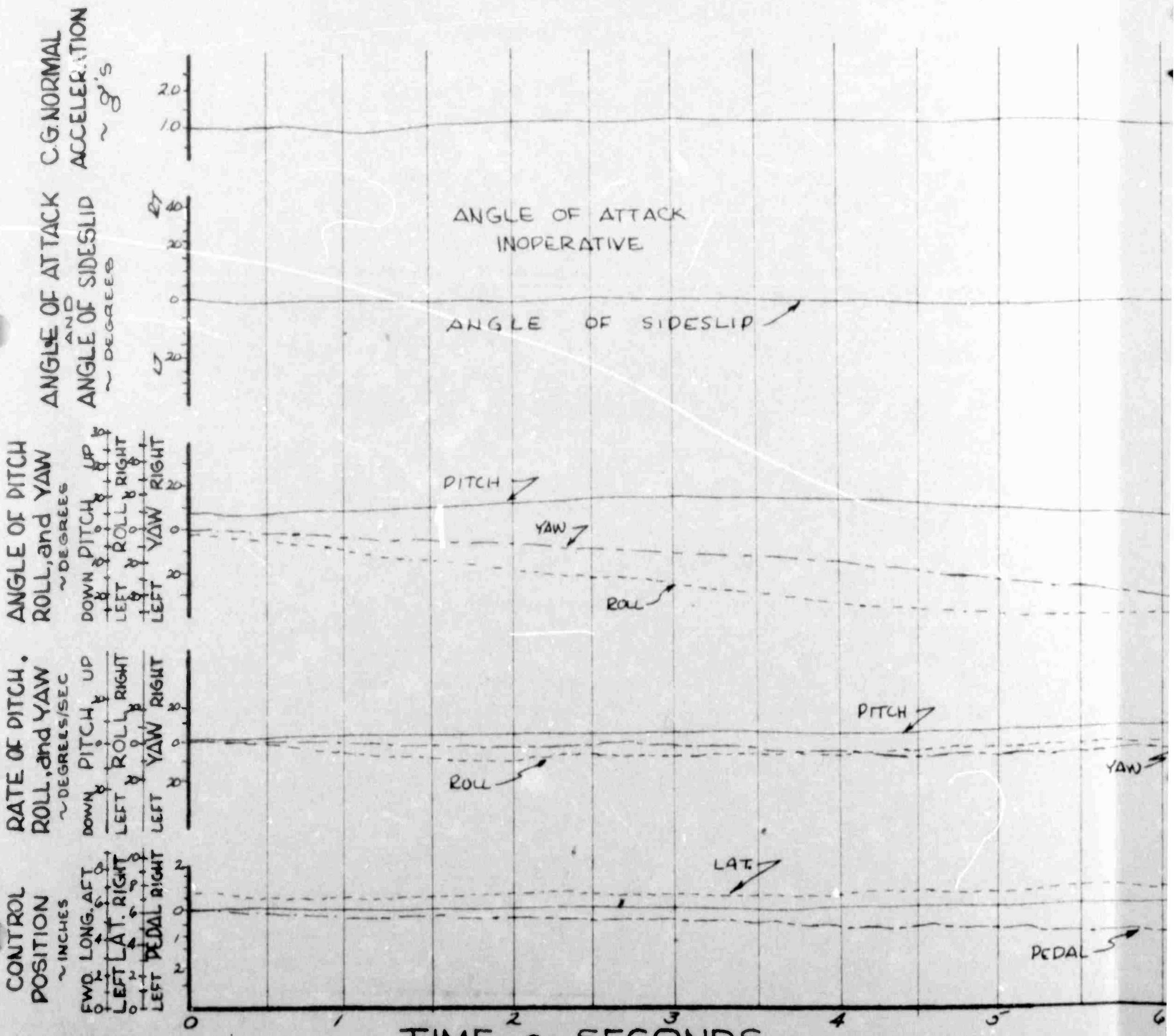
TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-8 (3.5° UP)
AVERAGE GROSS WEIGHT: 2585 LBS
LONG. C.G. LOCATION: 105.50 IN. (AFT)
LATERAL C.G. LOCATION: 1.10 IN. (LT)

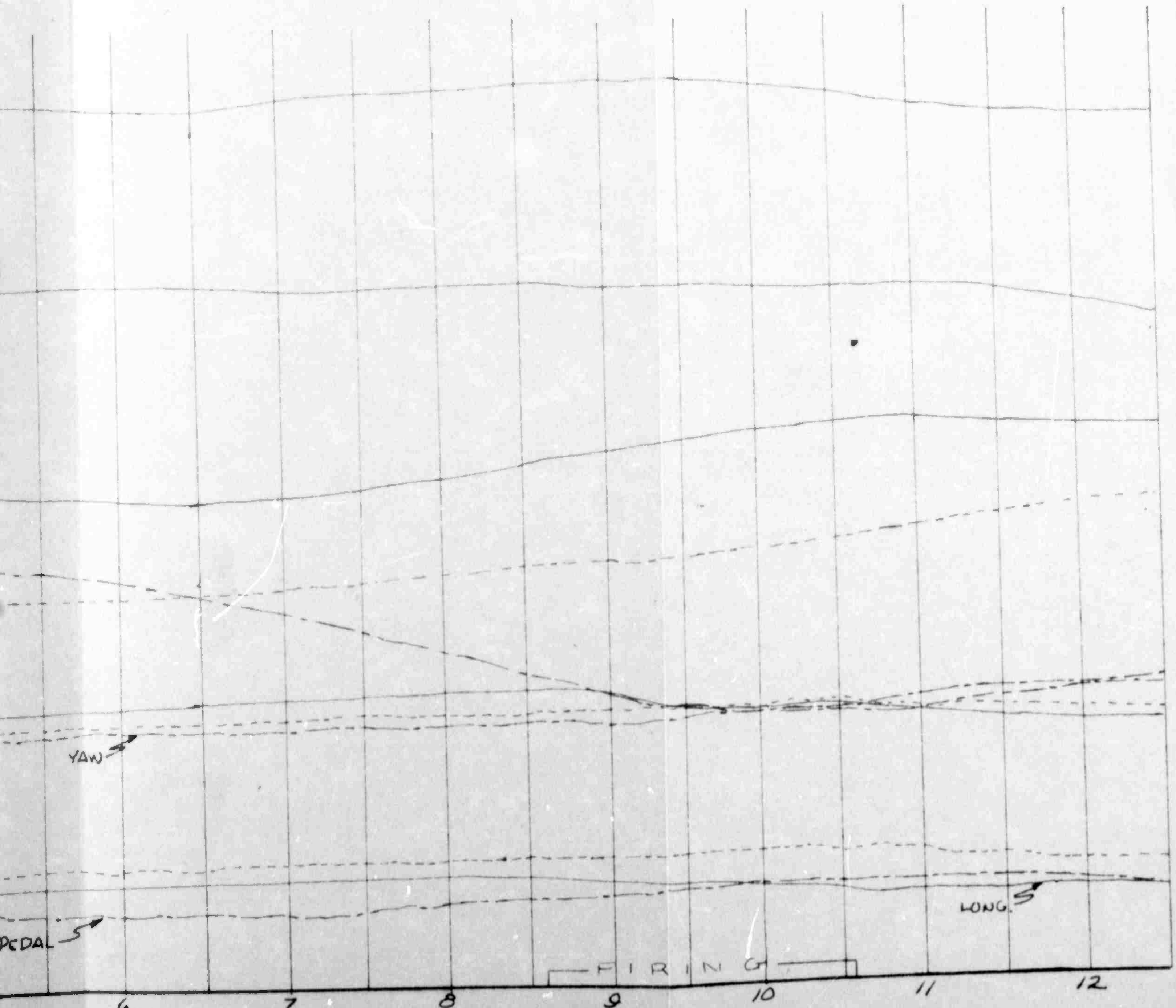
FLIGHT CONDITION: LT ROLLING PULL-UP (SAE-ON)
TRIM CAS: 92 KNOTS
DENSITY ALTITUDE: 5710 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG STICK
ROLL - - - - and LAT. STICK
YAW — - — - and PEDAL



FOR OFFICIAL USE ONLY

P(SAE-ON)



2

FIGURE NO. 239

TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

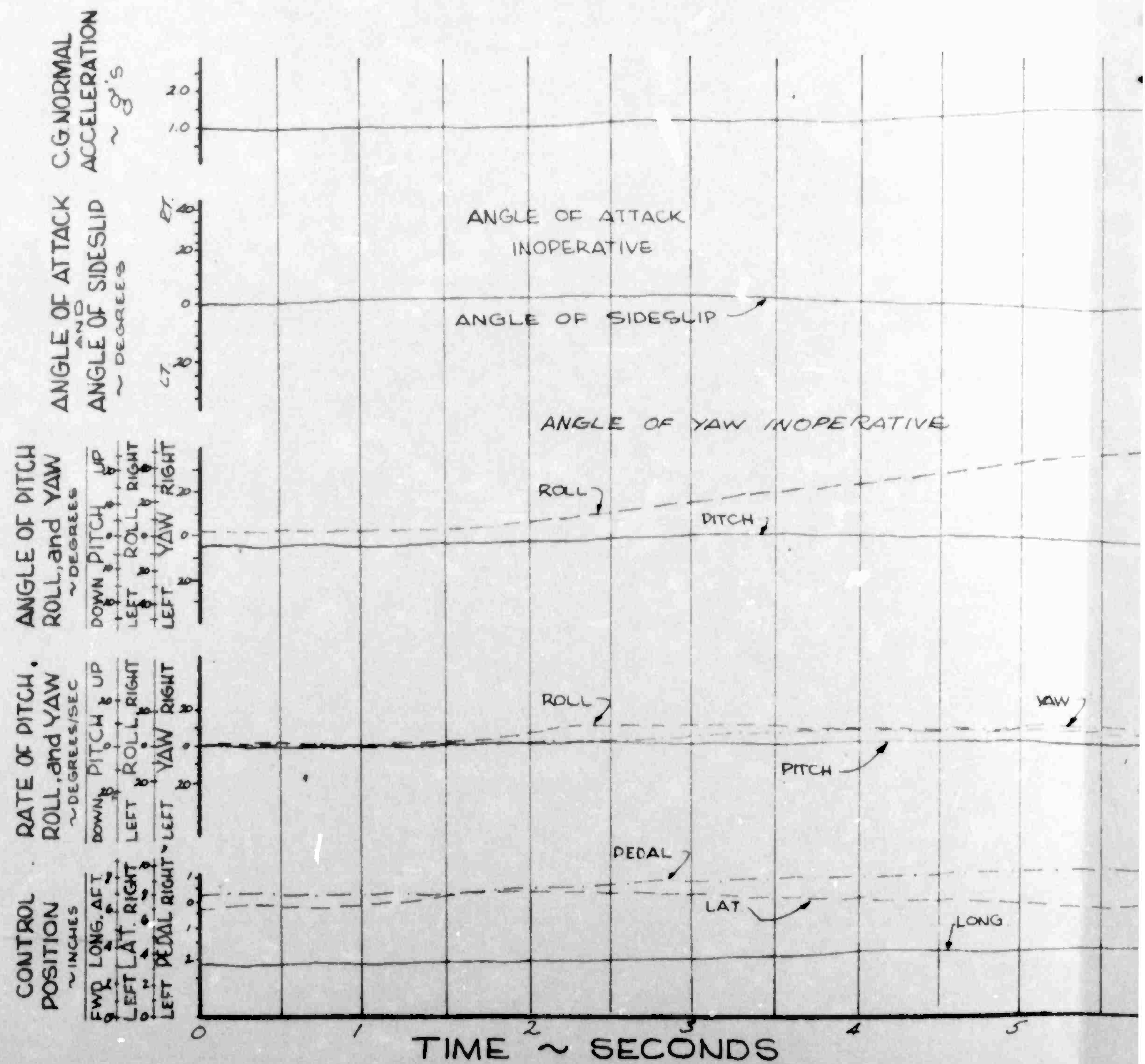
CONFIGURATION: XM-8 (35° DOWN) FLIGHT CONDITION: RT ROLLING PULL-UP (SAE-C

AVERAGE GROSS WEIGHT: 2545 LBS. TRIM CAS: 92 KNOTS

LONG. C.G. LOCATION: 105.35 IN. (AFT) DENSITY ALTITUDE: 5710 FEET

LATERAL C.G. LOCATION: .95 IN. (RT) ROTOR SPEED: 394 RPM

PITCH ——— and LONG. STICK ROLL - - - - and LAT. STICK YAW — - — - — and PEDAL



FOR OFFICIAL USE ONLY

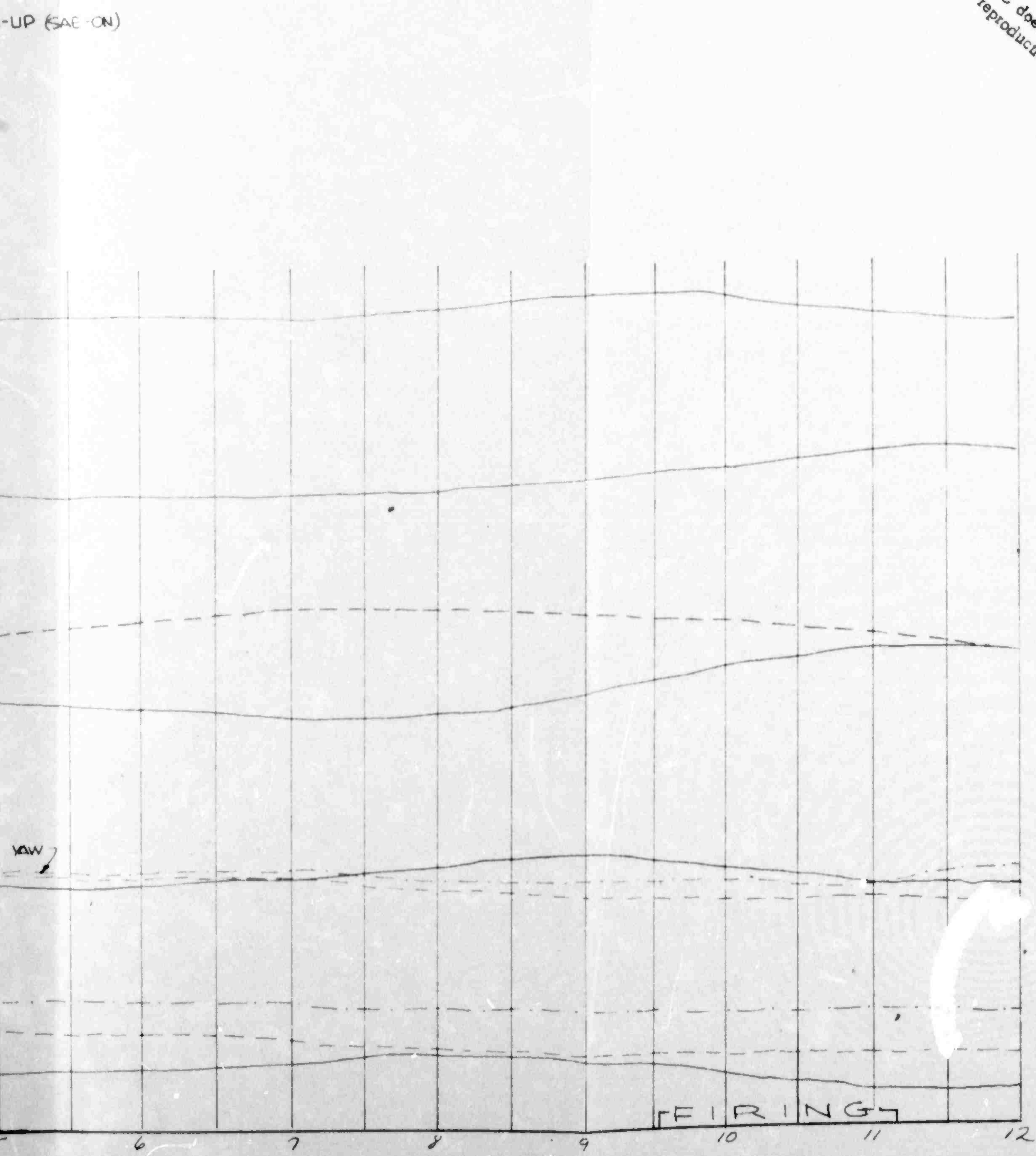

-UP (SAE-ON)
YAW
FIRING
6
7
8
9
10
11
12

FIGURE NO. 240

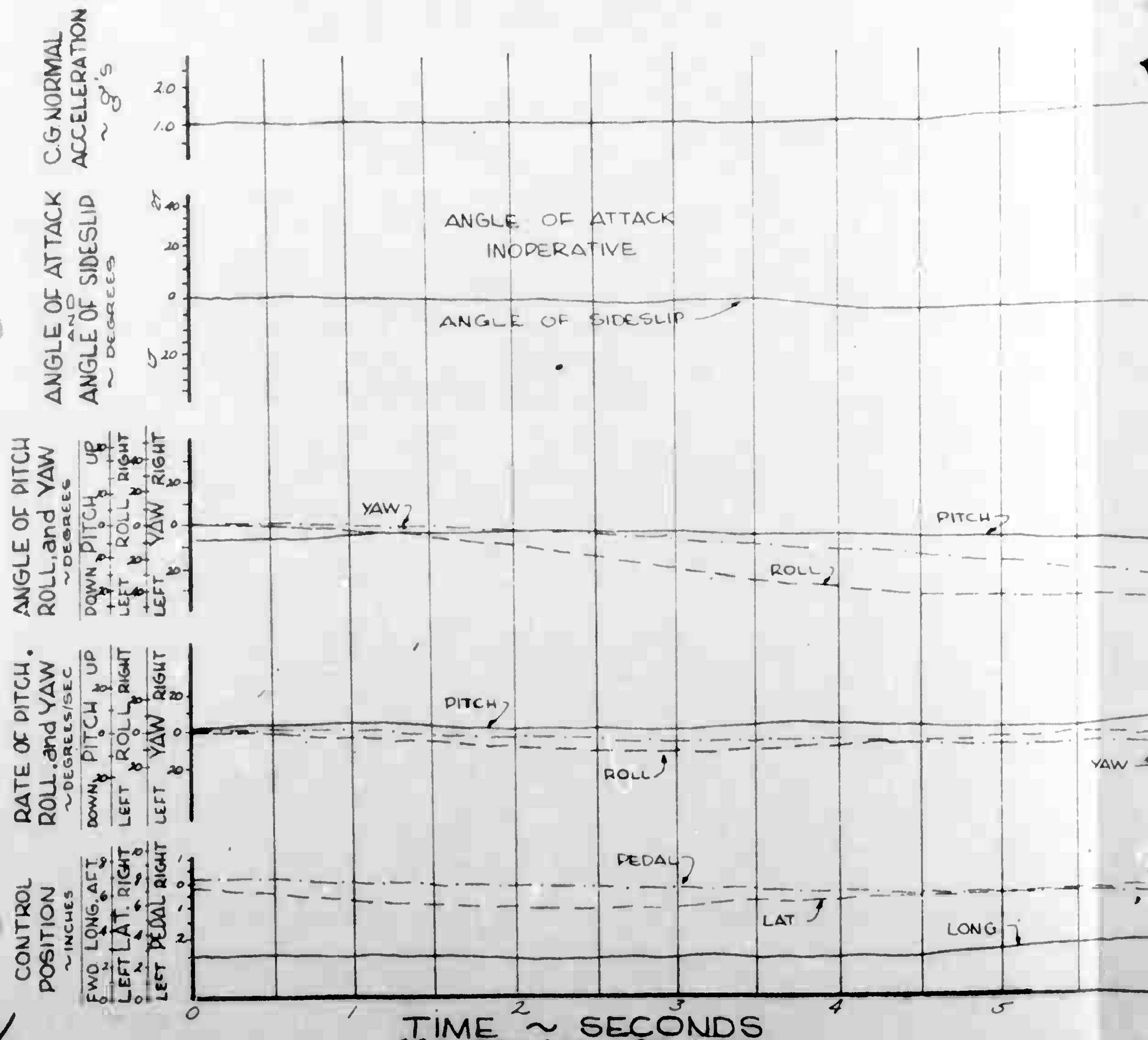
TIME HISTORY OF ARMAMENT FIRING

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-8(35° DOWN)
AVERAGE GROSS WEIGHT: 2555 LBS.
LONG. C.G. LOCATION: 105.40 IN.(AFT)
LATERAL C.G. LOCATION: 1.00 IN (LT.)

FLIGHT CONDITION: LT. ROLLING PULL-UP(SAE-ON)
TRIM CAS: 92 KNOTS
DENSITY ALTITUDE: 5710 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG STICK
ROLL – – – – and LAT. STICK
YAW – · – · – and PEDAL



FOR OFFICAL USE ONLY

(SAE-ON)

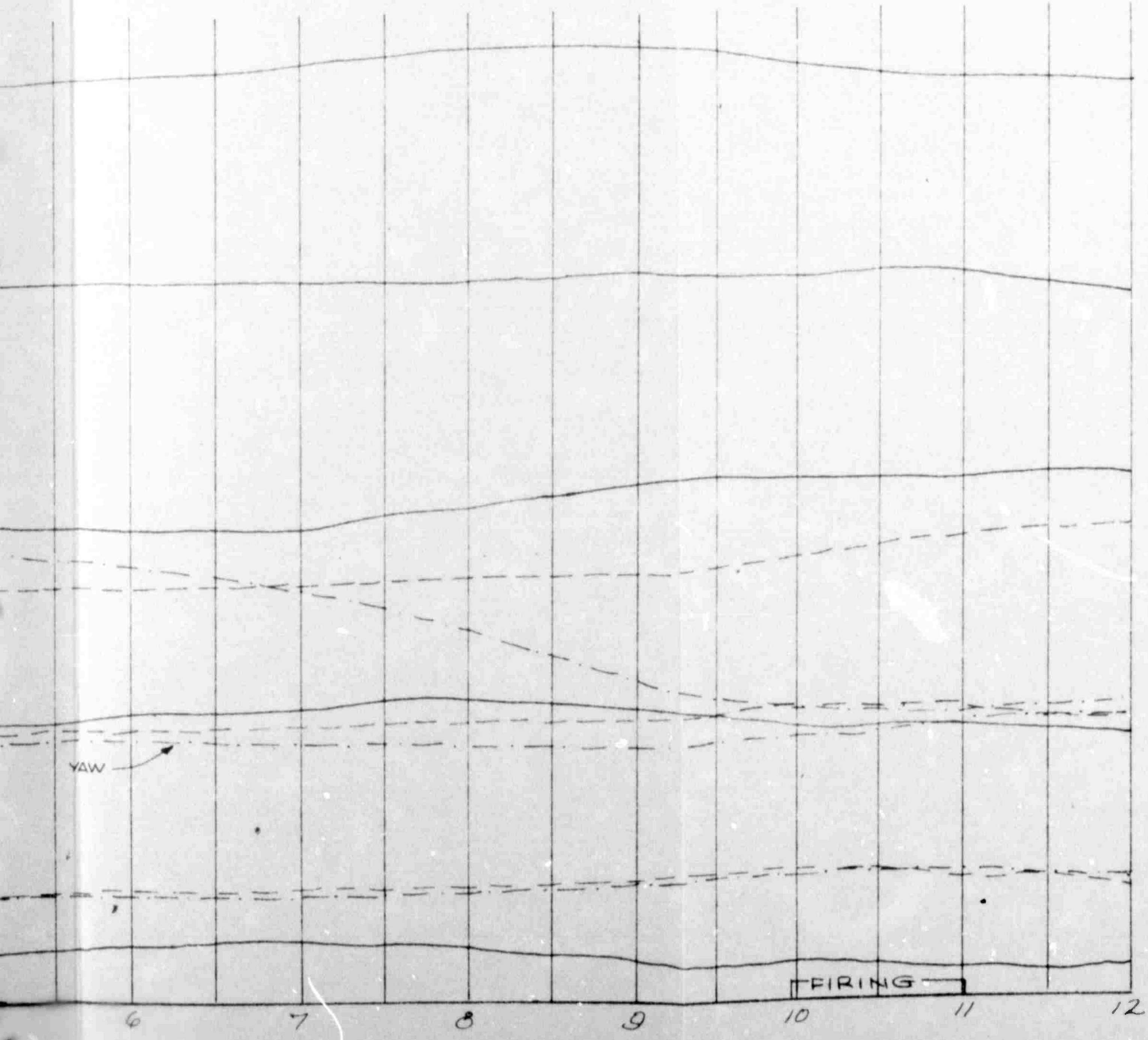


FIGURE NO. 241

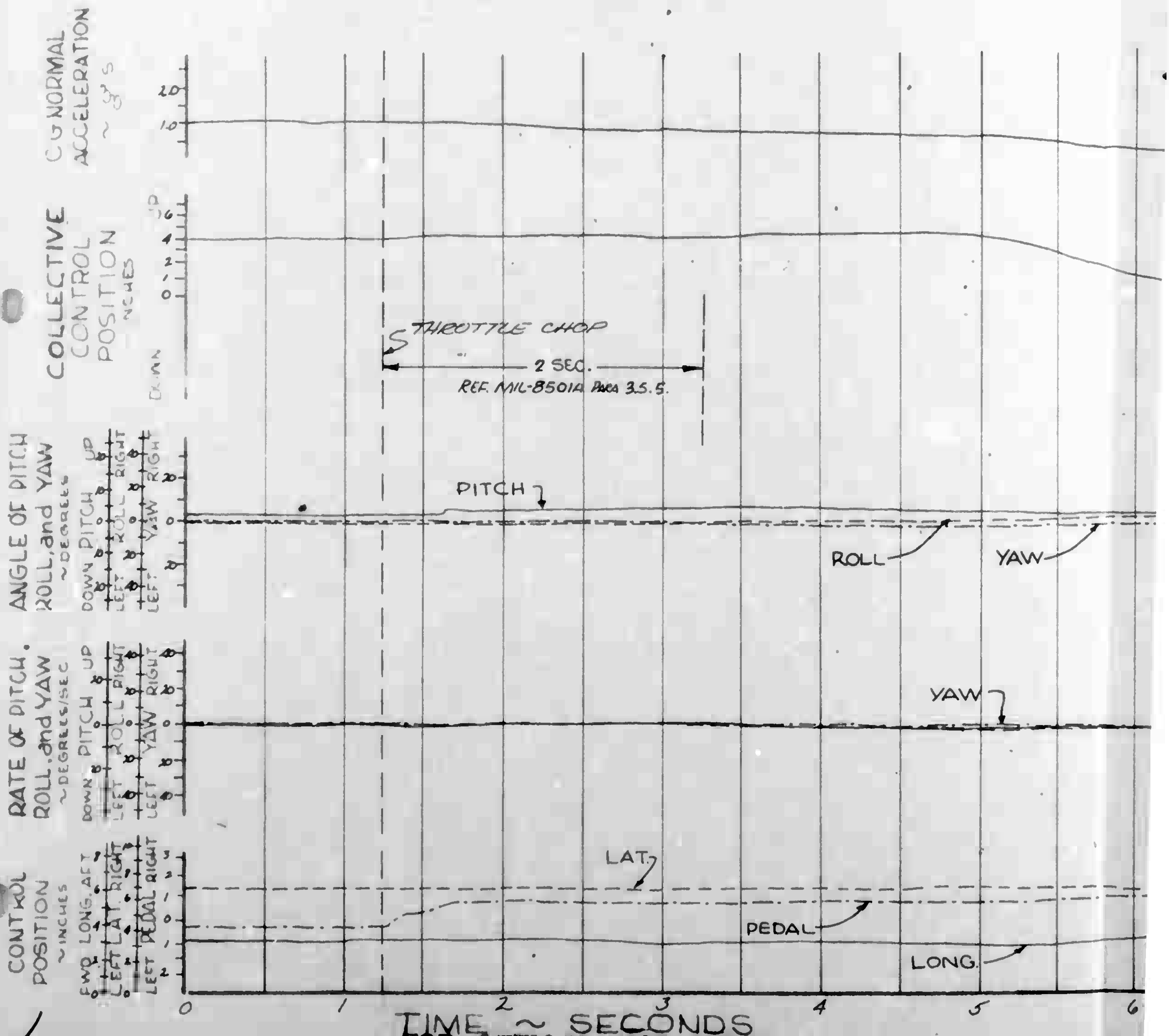
TIME HISTORY OF A THROTTLE CHOP

OH-4A, U.S.A., S/N 62-4204

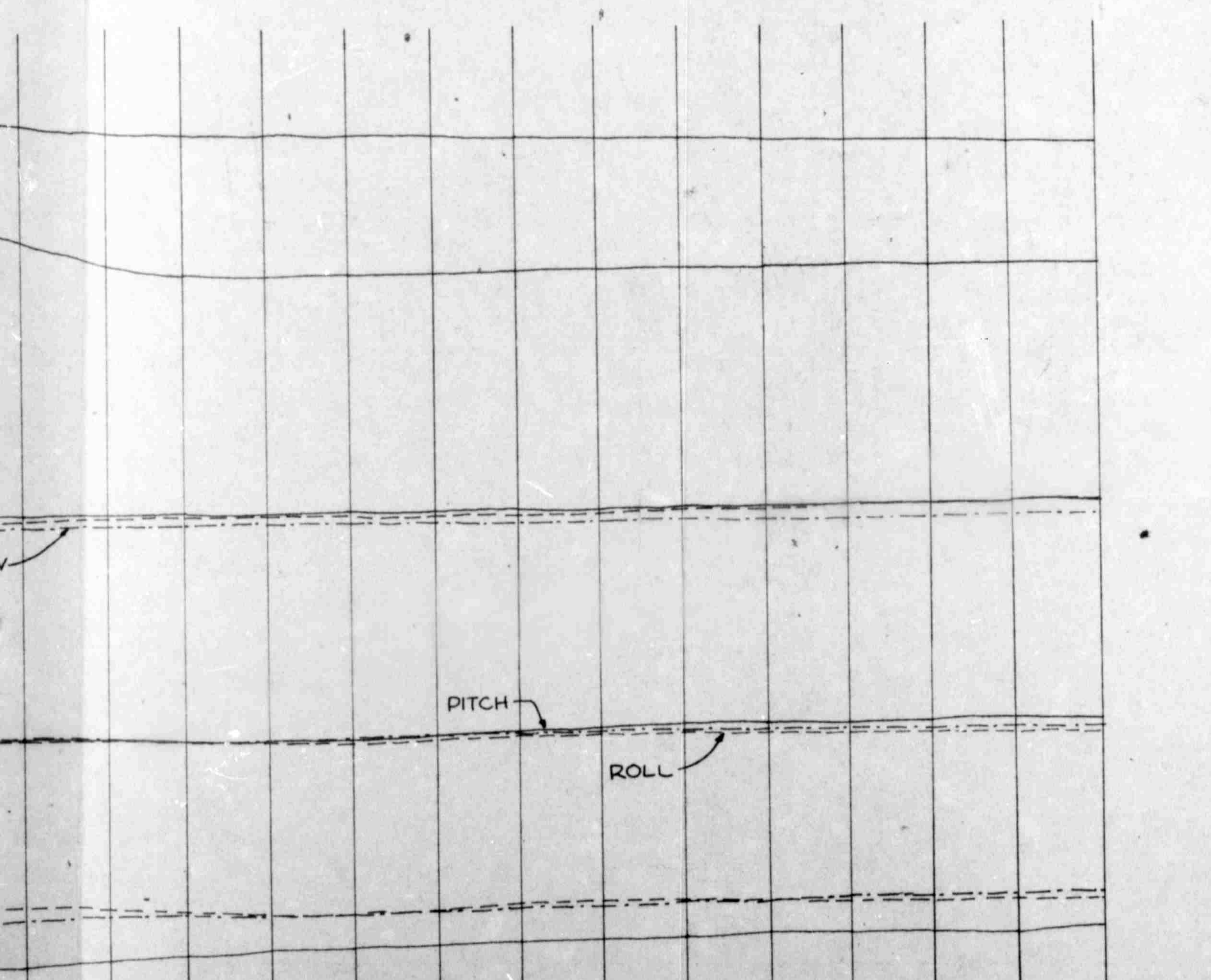
CONFIGURATION: XM-8 STOWED
AVERAGE GROSS WEIGHT: 2545 LBS.
LONG CG LOCATION: 105.00 IN. (AFT)
LATERAL CG LOCATION: 1.30 IN. (LT.)

FLIGHT CONDITION: CLIMB (SAE-OFF)
TRIM CAS: 43.5 KNOTS
DENSITY ALTITUDE: 5000 FEET
ROTOR SPEED: 394 RPM

PITCH and LONG STICK ———
ROLL and LAT STICK - - - -
YAW and PEDAL — - — -



FOR OFFICAL USE ONLY



PITCH
ROLL
6
7
8
9
10
11
12

FIGURE NO. 242

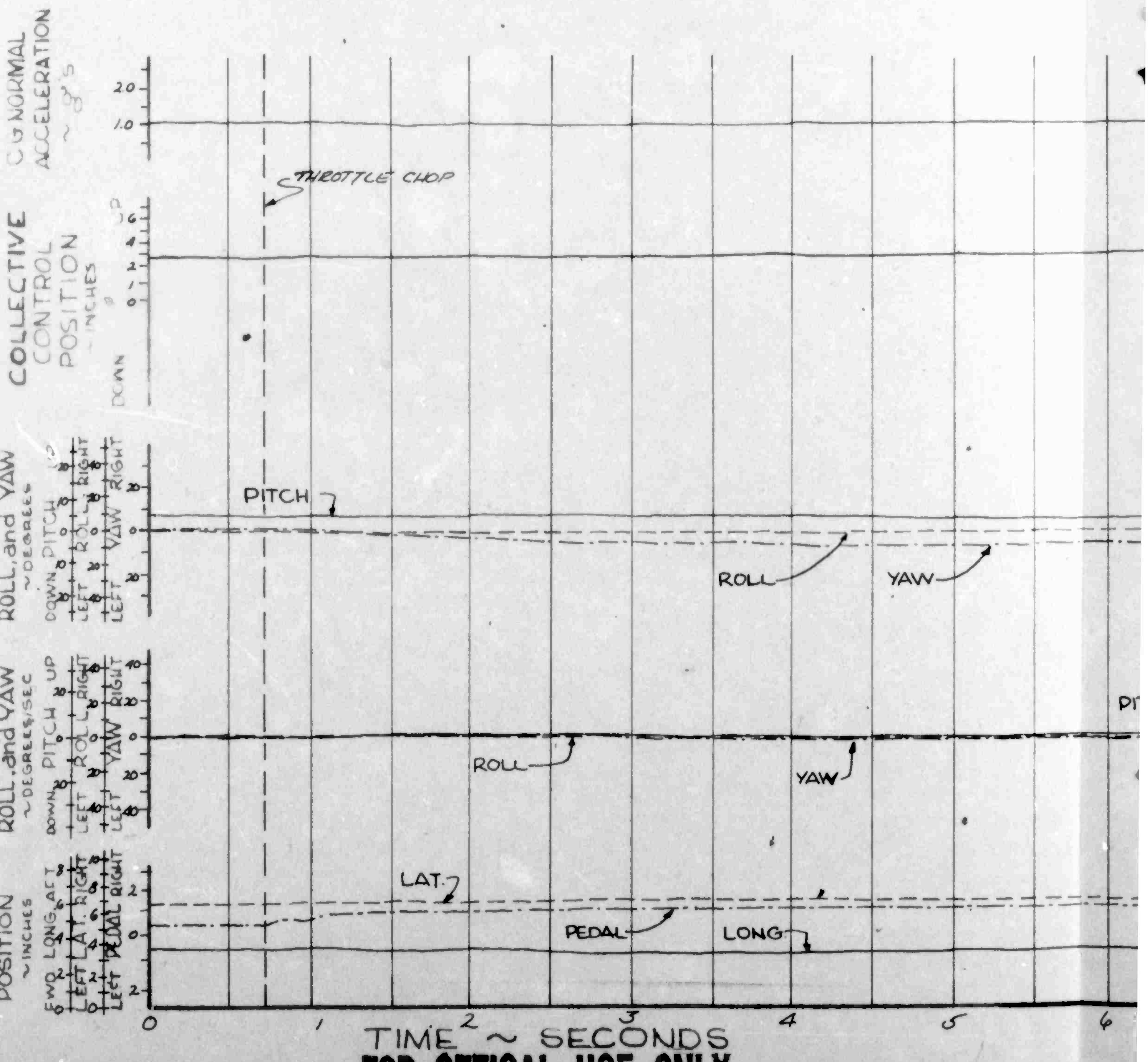
TIME HISTORY OF A THROTTLE CHOP

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-8 STOWED
AVERAGE GROSS WEIGHT: 2550 LBS.
LONG. C.G. LOCATION: 105.00 IN. (AFT)
LATERAL C.G. LOCATION: 1.30 IN. (LT.)

FLIGHT CONDITION: LEVEL FLIGHT (SAE-OFF)
TRIM CAS: 43.5 KNOTS
DENSITY ALTITUDE: 5000 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG STICK
ROLL - - - - and LAT STICK
YAW — - — - and PEDAL



FOR OFFICAL USE ONLY

-OFF)

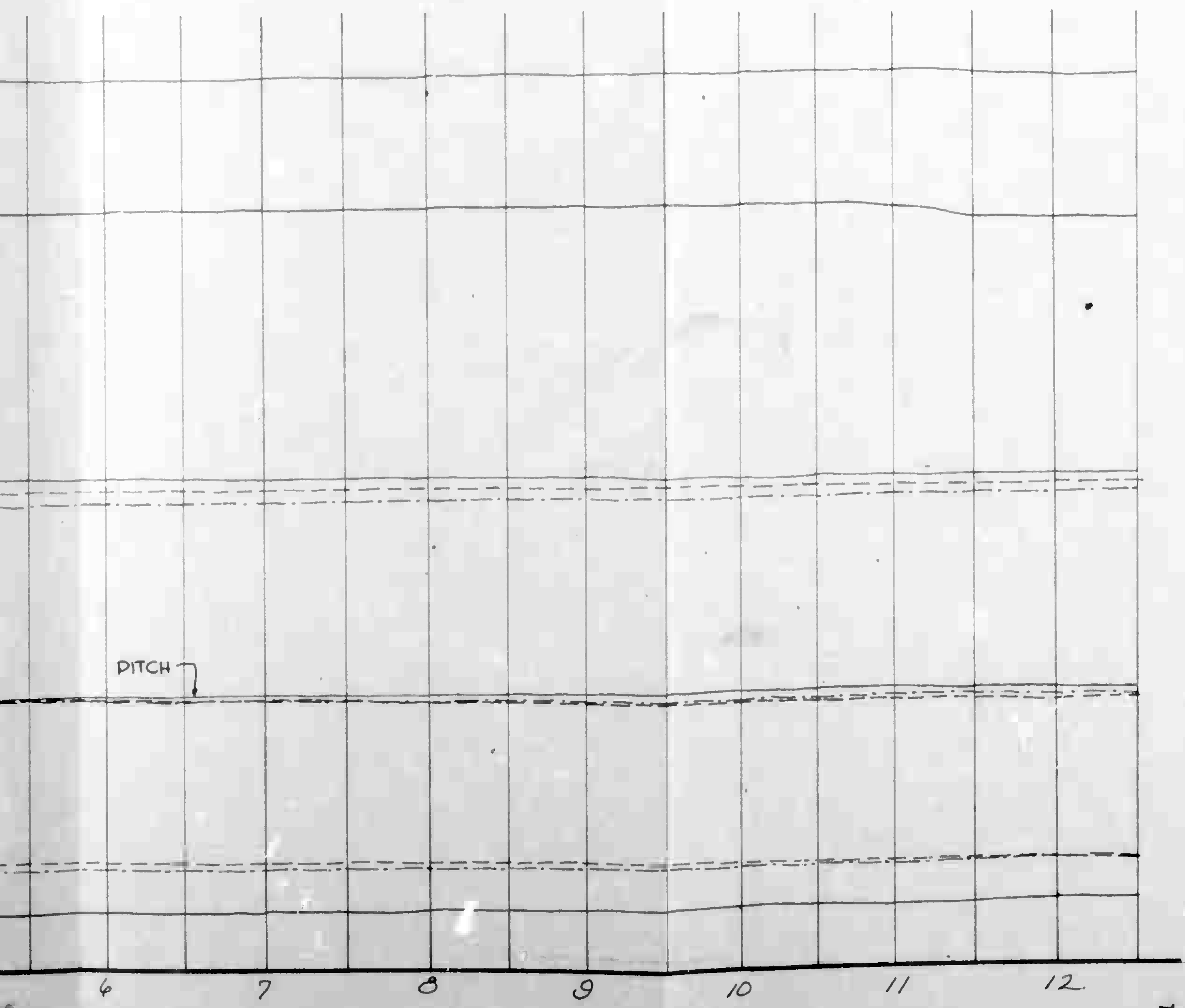


FIGURE NO 243

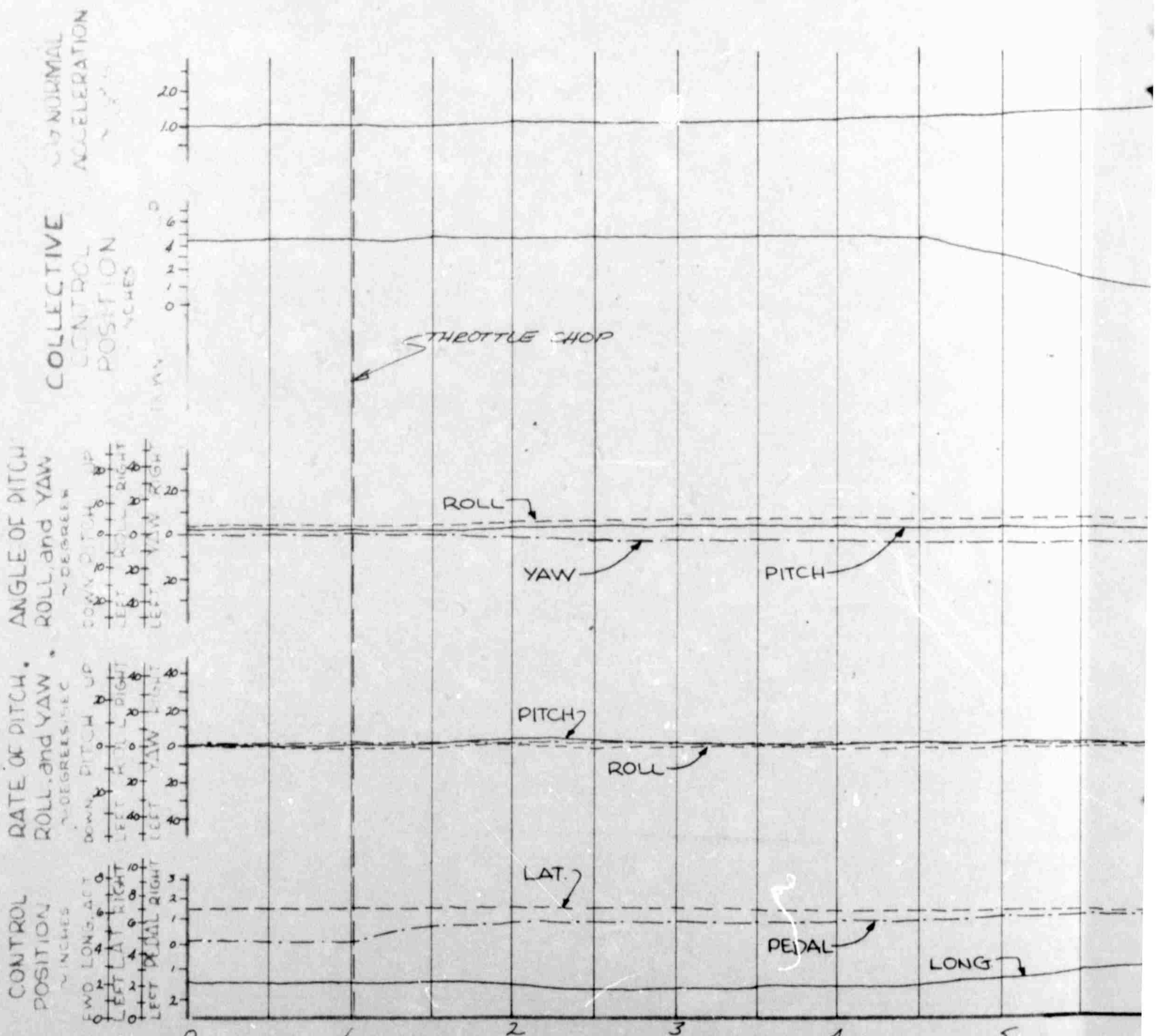
TIME HISTORY OF A THROTTLE CHOP

OH-4A, U.S.A., S/N 62-4204

CONFIGURATION: XM-8 STOWED
AVERAGE GROSS WEIGHT: 2555 LBS.
LONG CG LOCATION: 105.05 IN. (AFT)
LATERAL CG LOCATION: 1.30 IN. (LT)

FLIGHT CONDITION: LEVEL FLIGHT (SAE-OFF)
TRIM CAS: 86 KNOTS
DENSITY ALTITUDE: 5000 FEET
ROTOR SPEED: 394 RPM

PITCH ——— and LONG STICK
ROLL - - - - and LAT STICK
YAW — - — - and PEDAL



FOR OFFICIAL USE ONLY

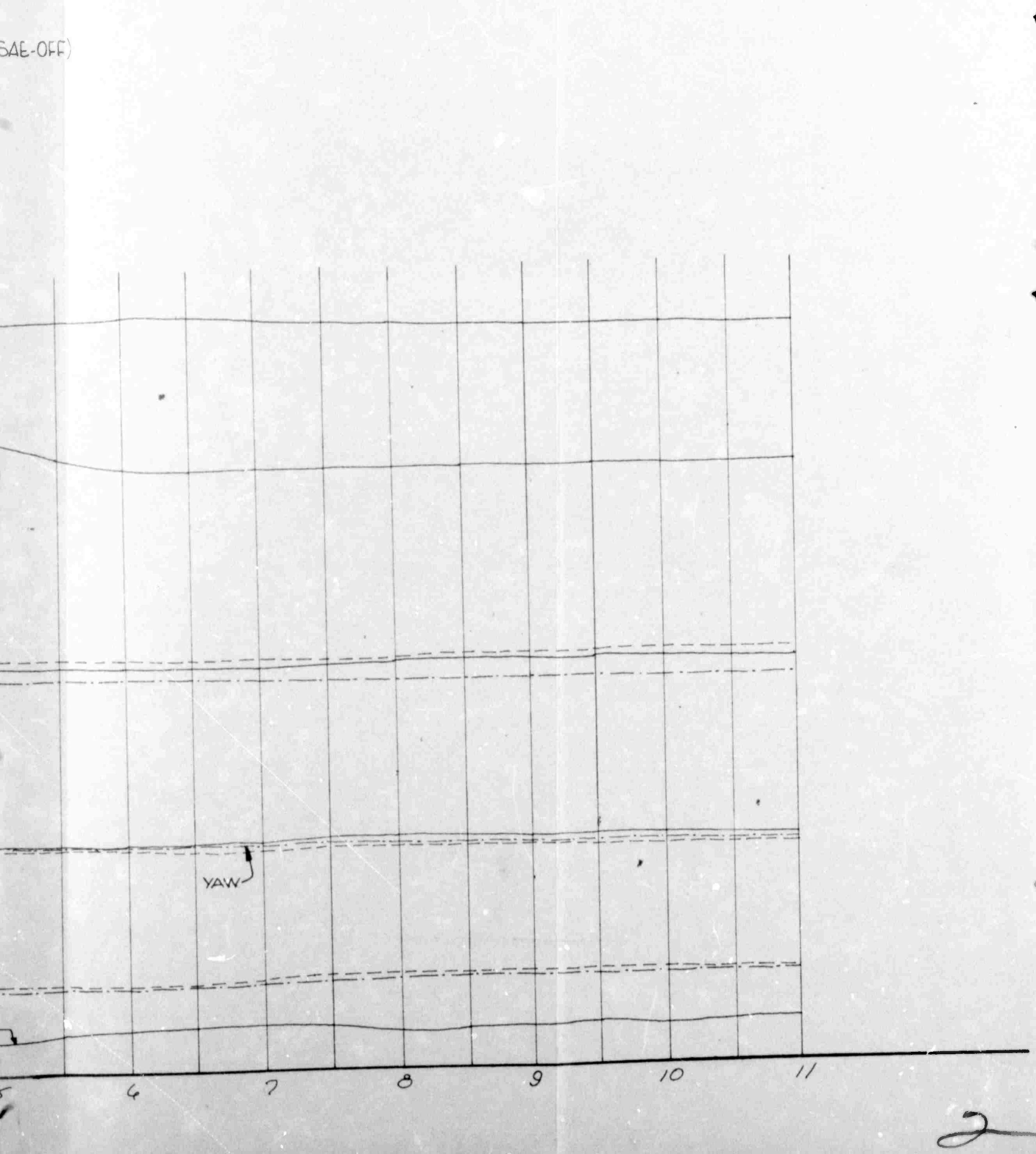
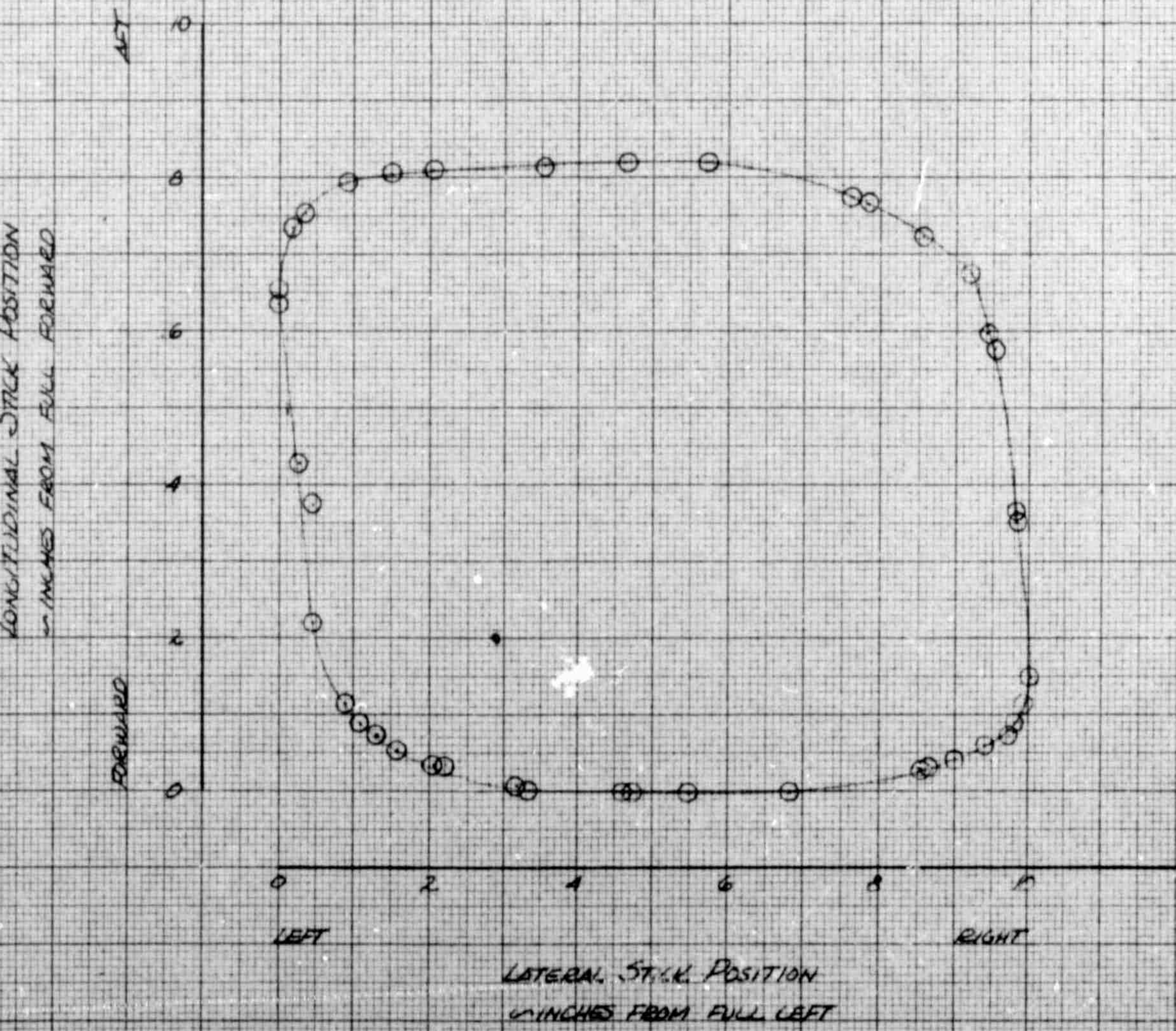

SAE-OFF)
YAW
6
7
8
9
10
11

FIGURE NO. 2.44
CYCLIC PITCH CONTROL PATTERN
OH-4A USA S/N 62-4204



FOR OFFICIAL USE ONLY

FIGURE NO. 245

LONGITUDINAL CONTROL FORCES

OH-4A USA S/N 62-4204

NOTE:

1. TESTS CONDUCTED WITH HELICOPTER ON THE GROUND WITH ROTOR STATIC.
2. HYDRAULIC PRESSURE APPLIED TO THE CONTROL SYSTEM BY AN EXTERNAL SOURCE.
3. FULL FRICTION APPLIED

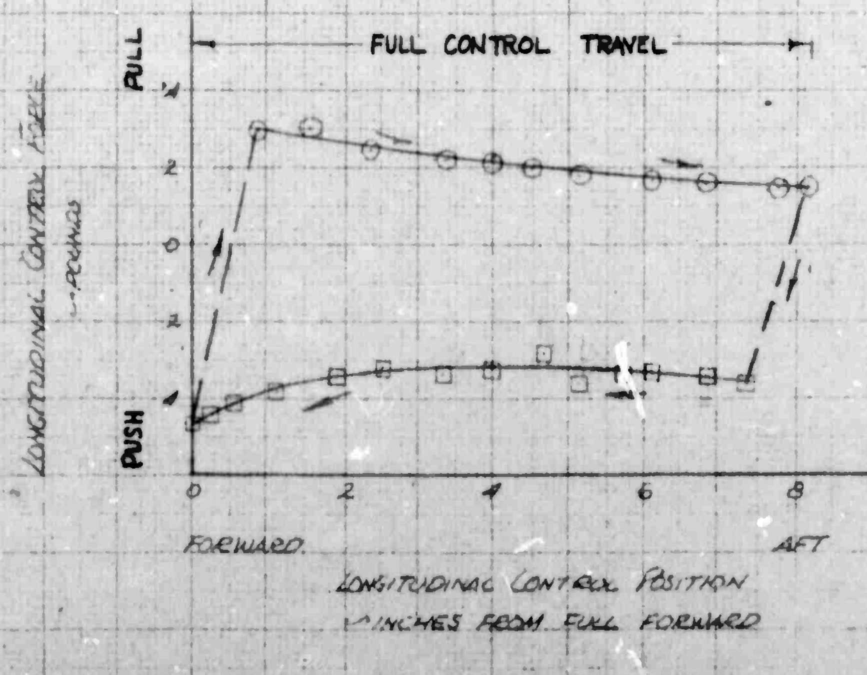


FIGURE NO. 246
LATERAL CONTROL FORCES
OH-4A USA S/N 62-4204

NOTE:

1. TESTS CONDUCTED WITH [illegible]COPTER ON THE GROUND AND WI[illegible] THE ROTOR STATIC
2. HYDRAULIC PRESSURE APPLIED TO THE CONTROL SYSTEM BY AN EXTERNAL SOURCE
3. FULL FRICTION APPLIED.

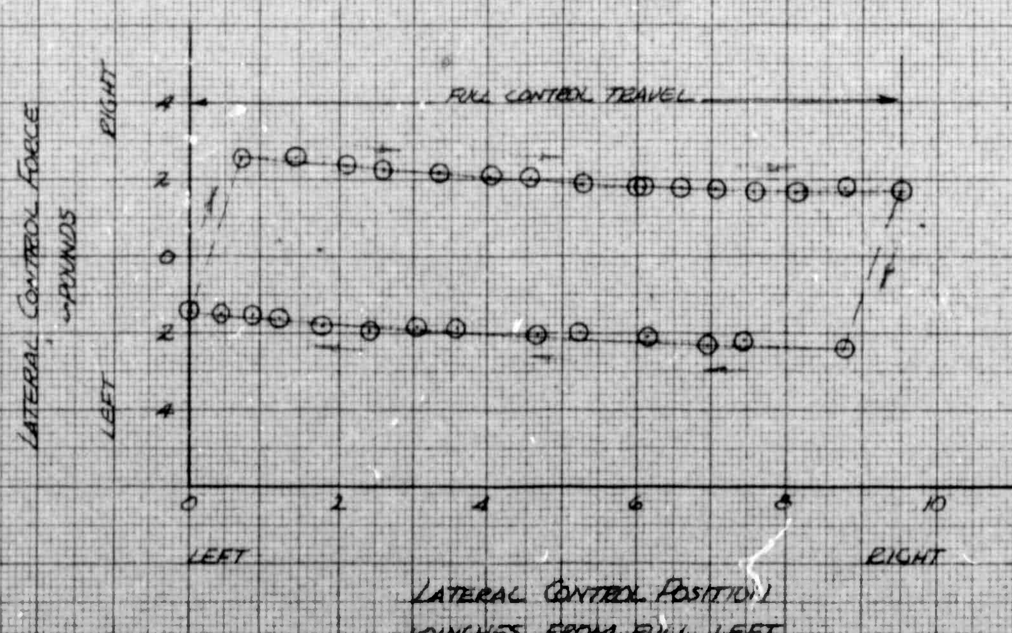


FIGURE NO. 247
PEDAL FORCES
OH-4A USA S/N 62-4204

NOTE:

1. TESTS CONDUCTED WITH HELICOPTER ON THE GROUND WITH THE ROTOR STATIC
2. HYDRAULIC PRESSURE APPLIED TO THE CONTROL SYSTEM BY AN EXTERNAL SOURCE.

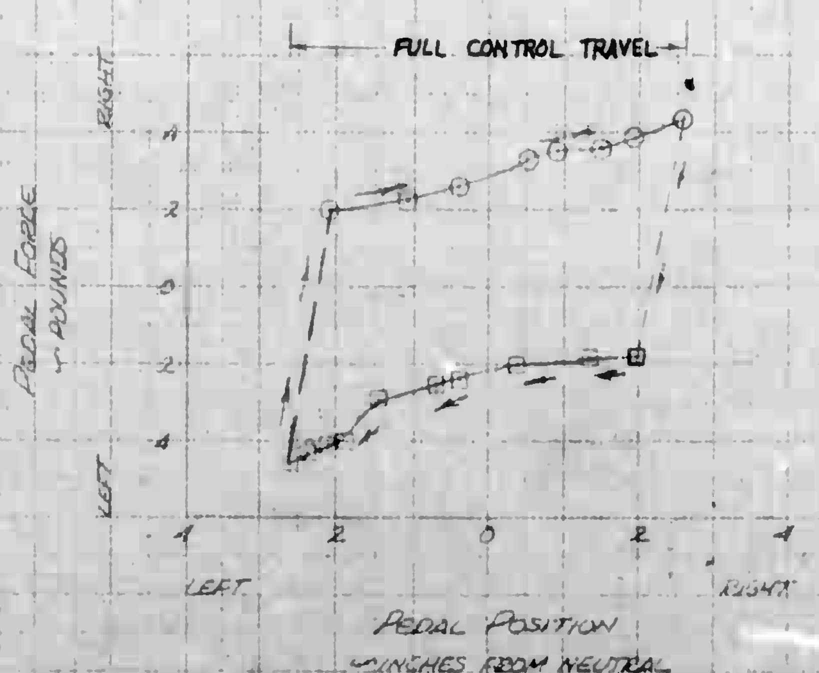


FIGURE NO. 248
AIRSPEED CALIBRATION
OH-4A USA S/N 62-4204
GROUND SPEED COURSE METHOD
TEST SYSTEM

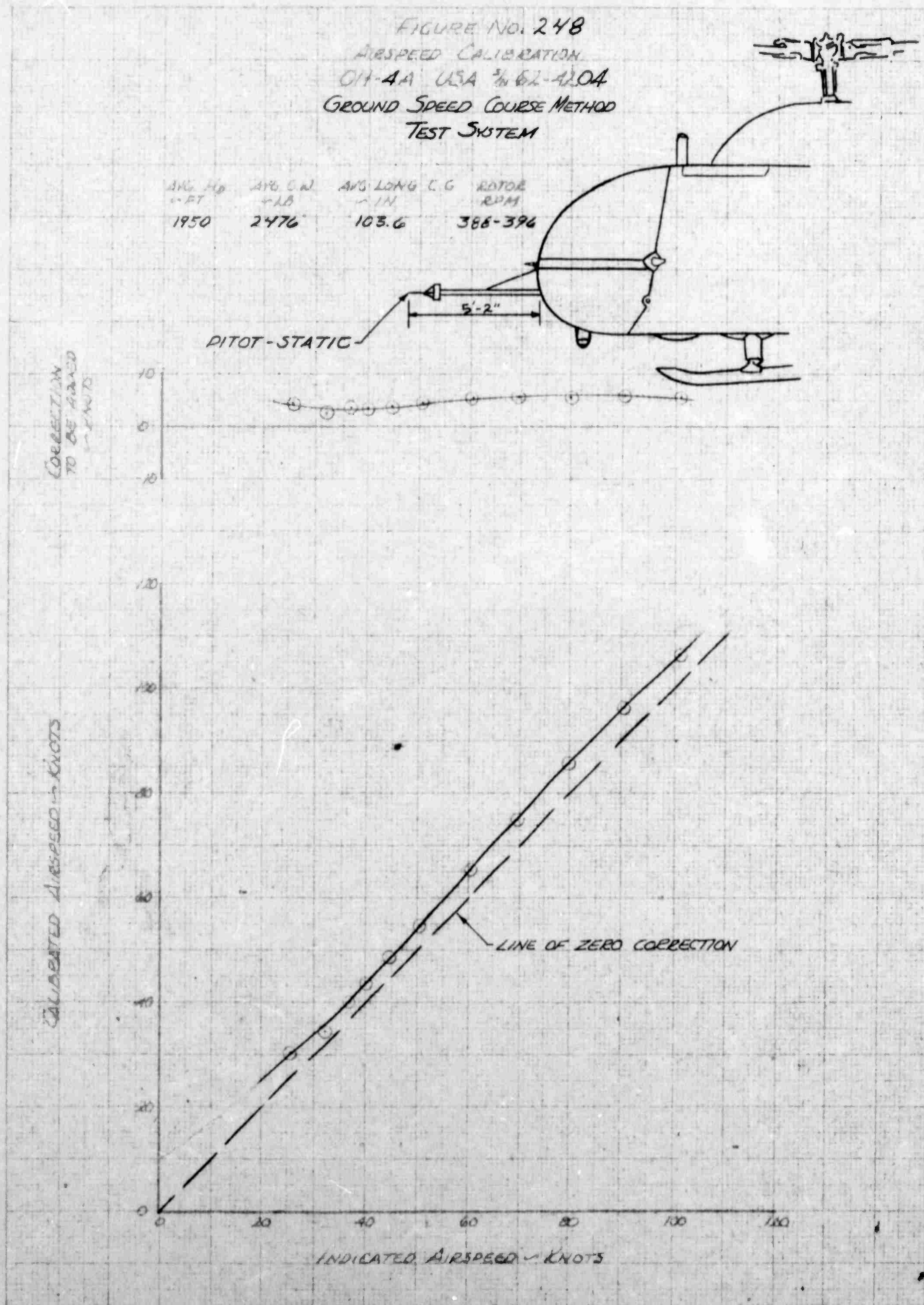


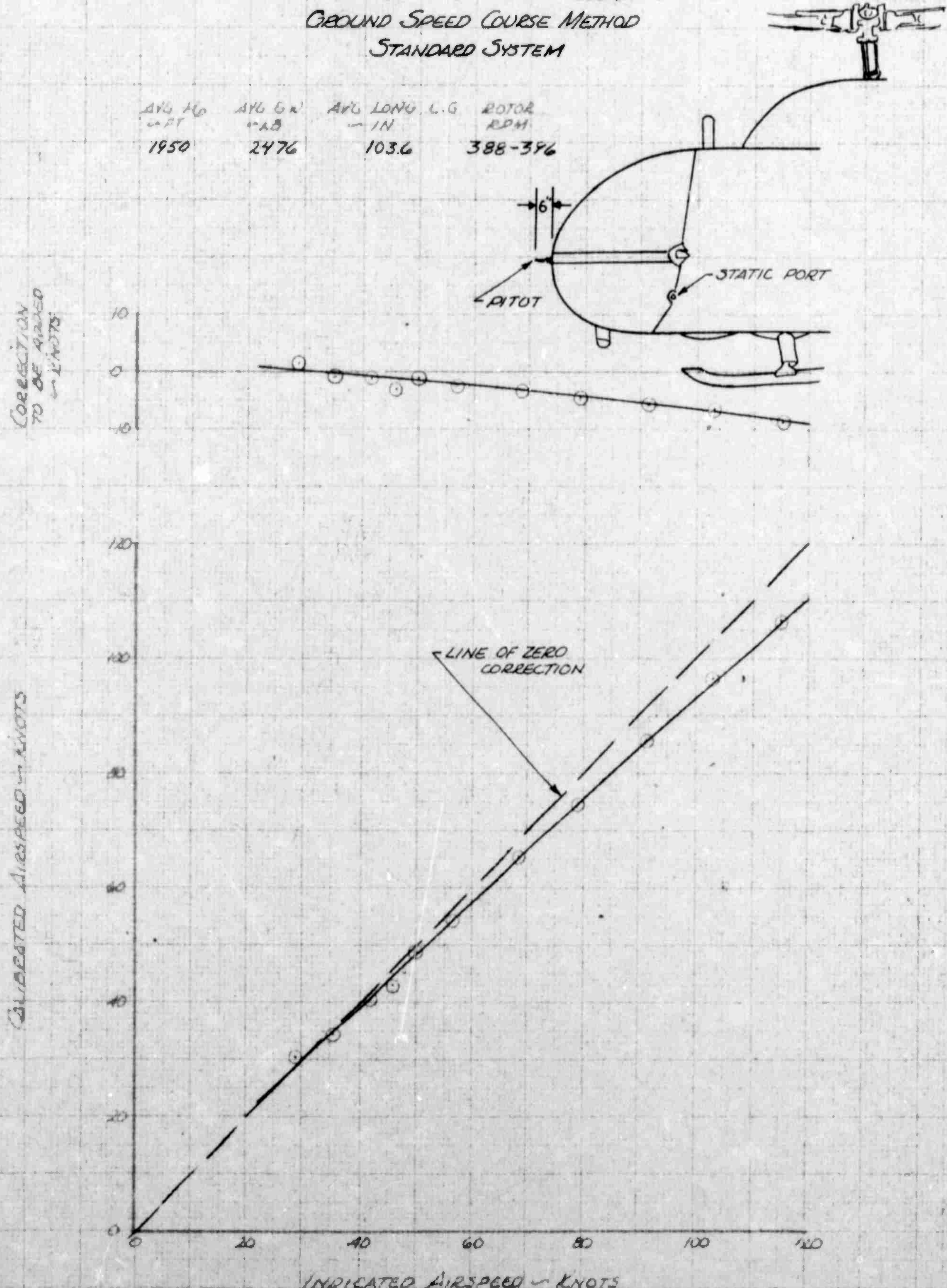
FIGURE NO. 249

AIRSPEED CALIBRATION

OH-4A USA S/N 62-4204

GROUND SPEED COURSE METHOD

STANDARD SYSTEM



APPENDIX II

GENERAL AIRCRAFT INFORMATION

Aircraft Dimensions, Design Data, FAA Type Inspection Authorization Limitations, Weight and Balance, and Instrumentation

1. Sources of Information

The following descriptive and design information was obtained from the FAA approved Flight Manual and the limitations were obtained from the FAA Type Inspection Authorization applicable at the time of the tests. The aircraft was flown to these limitations unless otherwise stated in the body of the report.

2. Description of Aircraft and Systems

2.1 Aircraft Design Data

a. Aircraft Dimensions and Certified Weights

Length (nose to tail skid)	29ft 9.6 in.
Length (rotors turning)	38ft 8.6 in.
Height (tip of main rotor static blade with droop stop engaged)	7ft 1.0 in.
Height (to top of rotor mast)	8ft 10.5 in.
Height (tip of main rotor aft blade neutral position)	9ft 9.4 in.
Width (tread)	7ft 2.75 in.
Rotor Diameter	33ft 4.0 in.
Empty Weight (approximately)	1520 lb
Design Gross Weight	2572 lb
Overload Gross Weight	2900 lb

b. Control Travel

Collective Pitch (full down to full up)	11.2 in.
Cyclic Pitch (full forward to full aft)	8.2 in.
(full left to full right)	9.5 in.

Pedal (full left of neutral)	2.6 in.
(full right of neutral)	2.6 in.

c. Rotor Dimensions and Design Data

Main Rotor:

Number of blades	2
Rotor Diameter	33ft 4.0 in.
Rotor Solidity	.0464
Swept Area	872.69ft^2
Blade chord (root to tip)	1ft 2 in.
Blade Airfoil (root to tip)	Modified NACA 0011
Flapping angle	$\pm$ 4.5 deg
Blade Twist	- 10 deg

Tail Rotor

Number of blades	2
Rotor Diamter	5ft
Rotor Solidity	.1114
Swept Area	19.6ft^2
Blade chord (root to tip)	2.71 in.
Blade Airfoil (root to tip)	BHC-TAD-S_2
Blade Twist	0 deg

d. Gear Ratios

Power turbine to engine output shaft	5.833/1.0
Engine output shaft to rotor	15.23/1.0
Engine output shaft to tail rotor	2.35/1.0

2.2 Aircraft Systems

2.2.1 Electrical System

Direct current electrical power is supplied by a 28 volt nickel-

cadmuim battery and supply system. Provisions are available for external power to be used during starts or ground operation and a 150 ampere generator maintains electrical power while in flight. Circuit breakers in the DC circuit breaker panel on the overhead console furnish protection for the system.

The alternating current is supplied by a 50 volt ampere, single phase transistorized inverter, which converts the 28 volt DC to 115 volt AC and 6 volt AC. The 115 volt power is supplied to the gyro-horizon, directional gyro, AC caution light and the AC failure relay. The 6 volt AC supplies power for the engine out warning light. The AC system is protected by circuit breakers on the overhead console.

2.2.2 Power Plant

The test aircraft was equipped with an Allison T63-A-5 gas turbine engine. This engine is designed to produce 275 shaft horsepower for takeoff at 6000 rpm (engine output shaft speed) on a sea level standard day.

2.2.3 Landing Gear

The helicopter is equipped with a skid-type landing gear attached to the fuselage at the four points. Ground handling wheels are provided as loose equipment and may be installed for moving the helicopter on the ground. Flight with wheels is unrestricted.

2.2.4 Fuel System

The fuel system incorporates a single bladder type fuel cell with a capacity of 76 gallons. The cell is located below and aft of the passenger seat. Two fuel boost pumps, two fuel quantity tank units and a low level warning switch are contained in the fuel cell. The fuel cell is filled through a filler cap located on the right side of the helicopter at Station 119.00.

2.2.5 Flight Control System

The flight control system is a push-pull tube mechanical type, activated by conventional helicopter controls. The system includes: the cyclic control stick, used for longitudinal and lateral control; the collective pitch control lever (main rotor), used for vertical and power control; and directional control pedals used for heading and anti-torque control. Removable dual controls are provided for the copilot.

The cyclic stick grip contains a radio/ICS thumb switch, a heading-hold engagement switch, a 4 way combination gun elevation and heading change switch and a trigger gun-firing switch. The latter 2 switches function only when an armament kit is installed. The moving friction of the cyclic control can be changed by hand tightening the friction adjuster located inboard of the control stick on the front face of the pilot's

seat support. The copilot's cyclic stick, when installed, has the same friction as the pilot's control stick. The copilot's cyclic control is removable for solo operation. Both sticks may be adjusted individually fore and aft by means of a knob located above the base of each cyclic control.

The collective pitch control lever functions in a conventional manner to provide vertical and power control. Desired operational friction can be set by hand tightening the friction adjusting knob located between the pilot's and copilot's seat cushions. A twist grip type throttle and a switch box assembly are located in the upper end of the pilot's collective pitch control lever. The twist grip includes an idle detent to prevent inadvertent engine cutoff. The switch box assembly contains the starter and landing light switches, gun charger switch and power turbine governor speed selector switch (beep switch). The copilot's collective pitch control lever, when installed, contains only the twist-grip type throttle control. The copilot's collective is removable for solo operation.

The pilot and copilot anti-torque pedals function in a conventional manner. Pedal adjusters located between the pedals enable adjustment of pedal distance for individual comfort. The copilot's anti-torque control pedals, when installed, are identical to the pilot's pedals and are removable for solo operation.

The single hydraulic system has two essential functions. First, it reduces pilot fatigue by use of servo actuators in the cyclic,collective and directional control systems, which furnish hydraulic assist for all control movements. Second, the servo cylinders in the cyclic system aid in damping out any feedback forces from the main rotor. The cyclic and collective servo actuators are equipped with irreversible valves which automatically provide irreversibility of the controls when hydraulic power is off or the system malfunctions.

The hydraulic system is composed of a pump package, control valve package, manual servo cylinders, self-sealing disconnect fittings, attaching lines and fittings. The pump package consists of a fixed displacement gear pump, reservoir, pressure regulator, fluid level gage, filter element and screen. A solenoid operated valve element and the main system filter constitutes the control valve package. The pump is driven by the transmission. This pump supplies pressure to the servo actuators, which are connected into the mechanical linkage of each control system. Hydraulic system pressure is present by the pressure regulator of the pump package to 600 psi. The system is serviced with MIL-L-7808 turbine oil. Capacity of the system is 2 pints. The reservoir capacity is 1 pint.

The main rotor is a 2 bladed, semi-rigid, see-saw type that is all-metal construction. The blade airfoil section is designed to provide both high lift and low profile drag. The blades may easily be manually folded for ease in shipping and storage. The rotor assembly is secured to the mast with a cap fitting which incorporates provisions for attaching a cable to hoist the helicopter. Oil lubrication (MIL-L-7808) is employed for the hub assembly and the oil level is inspected through the

the use of sight gages which are visible from the ground.

The stabilizer bar is mounted on the mast just below and 90 degrees to the main rotor blades. The purpose of the bar and associated control linkage is to use the inertia effect on the bar for stability. The mast following characteristic of the bar is regulated by 2 fixed orifice hydraulic dampers. The damping is such that for small disturbances the low rate damping is available. When larger disturbances are encountered the high rate damping is used. If the helicopter is upset by a gust or a control input, the bar tends to remain in its original plane and by doing so tends to return the helicopter to its original attitude just before the upset.

The tail rotor is a 2 bladded, semi-rigid type with each blade connected to a common yoke. The blade and yoke assembly is mounted on the tail rotor shaft by means of a delta flapping or see-saw hinge. Blade pitch is altered by the push-pull rod which runs through the tail rotor shaft. The tail rotor is designed to operate without requiring lubrication.

The transmission consists of a spiral bevel gear and a planetary gear stage. This unit is connected to the engine output shaft by a short drive shaft which passes through a free wheeling unit. The transmission output shaft then drives the main rotor and hydraulic pumps. Engine output shaft rpm is reduced to main rotor speed at a ratio of 15.11 to 1.

This transmission and its associated drive system are qualified for 300 shaft horsepower at 6000 rpm power turbine speed.

2.2.6 Stability Augmentation Equipment (SAE):

The OH-4A is equipped with single SAE for use with the armament installation only. The system provides damping about all 3 axes. The SAE is a combination of electrical and mechanical systems. The SAE uses electrical rate gyros' as the primary sensors. When a change in rate is sensed by these gyros an electrical signal is relayed to an electrical motor which applies the necessary corrective control input by extending or retracting the mechanical push-pull control tube(s). These corrective SAE control inputs are "mixed" with pilot inputs and have the following authorities (based on 100 percent pilot authority).

Pitch - 10 percent

Roll - 10 percent

Yaw - 25 percent

The yaw channel has limited heading-hold capability. Heading reference may be changed or "beeped" right or left at a slow rate while heading-hold is engaged.

Since control inputs are mixed with pilot inputs, the pilot must maintain control positions, as usual, to provide a reference or reaction point for the actuators to work against.

If the SAE inserts a "hardover" which is not desired, the system may be "overridden" by the pilot making control inputs in the normal manner. The force required is the normal force used to move the controls without SAE.

All actuators automatically return to center and lock when SAE is switched off. Centering will not occur, however, if the circuit breaker is used to switch off SAE. In this case the actuators will lock at the last position commanded by the sensors.

3. TIA Limitations

The following limitations were adhered to during the tests:

3.1 Engine and Transmission Limitations

a. Rating

	Take-off (5 min.)	Maximum Continuous
Shaft Horsepower	250	212
Gas Producer rpm	48,950	47,350
Output Shaft rpm	6000	6000
Measured Gas Temperature	1240°F (671°C)	1165°F (630°C)

NOTE: The above engine ratings are based on static sea level conditions. The maximum allowable torque as measured by the torque meter for below standard inlet air temperature and/or ram conditions is 240 foot pounds (275 HP @ 100 percent N_2) for take-off and 204 foot pounds (237 HP @ 100 percent N_2) for maximum continuous.

b. Temperature Limits

Measured Gas Temperature

Take-off (5 min.)	1360°F (738°C)
Maximum Continuous	1280°F (693°C)

Maximum Transient (Not to exceed 6 seconds)	1550°F (843°C)
Oil Inlet Temperature	-65°F to 200°F

3.2 Airframe and Rotor Limitations

		Maximum	Minimum
a.	Rotor Speed		
	Power - On	422	374
	Power - Off	445	356

		2450 Pounds
b.	Load Factor	
	Power - On	+2.5
	Power - Off	+2.5

c.	Weight and Center of Gravity	
	Design Weight	2450 pounds
	Overload Weight	2900 pounds
	Maximum Forward C.G.	Station 99.0
	Maximum Aft C.G.	Station 106.0
	Maximum Lateral C.G.	±3.0 inches from Centerline

3.3 Airspeed Limitation

a. Forward Flight [Speed in Knots Calibrated Airspeed (KCAS)]

		Airspeed	
2450 pounds	Vne	115	Decrease 4.5 knots/ 1000 feet above 3000 feet
	V_{Dive}	127	

b. Sideward and Rearward Flight [Speed in KCAS]

	Sideward	Rearward
2450 pounds	30	30
2900 pounds	30	30

3.4 Sideslip Limitation

Airspeed KCAS	Maximum Sideslip Angle Degrees Right	Left
40	40	40
115	10	10

4.0 Weight and Balance

The test OH-4A helicopter (S/N 62-4204) was weighed prior to installation of the test instrumentation with an electronic weighing kit in a closed hangar. The basic weight (full oil, trapped fuel and SAE installed) of the helicopter was 1600 pounds with a longitudinal C.G. of 107.9. The design gross weight of 2572 pounds can be obtained with the following loading:

Basic Weight	1600 pounds
Full Fuel (76 gal at 6.5 lb/gal)	494
Pilot	200
Cargo	278
Gross Weight	2572 pounds

Additional items (not included in the basic weight) which are considered as part of the useful load and may be required for various missions are as follows:

Passenger Seat Cushions	1.5
XM-7 Armament (left side only with full ammo in 4 cans)	375
XM-8 Armament Kit (full ammo in both ammo cans)	325

Removable items (included in the basic weight) which could be considered as part of the useful load and may not be required for various missions are as follows:

Pilot and Copilot Seat Cushions	2 pounds
Stability Augmentation Equipment	15 pounds

After installation of stability and control instrumentation the aircraft was reweighed and the basic weight was 1716 pounds. All tests were flown at either the design gross weight of 2572 pounds or the overload gross weight of 2900 pounds. All of the test flying was accomplished with the Center of Gravity located near the forward (Station 99.0) and aft (Station 106.0).

5.0 Test Instrumentation

The test instrumentation used during this test program was supplied, calibrated, installed and maintained by the Instrumentation Branch of the U. S. Army Aviation Test Activity. A swivel type pitot-static airspeed head was installed on a nose boom which extended 5 ft 2 in forward from the nose of the aircraft. The following parameters were available through sensitive instrumentation:

Cockpit Instrument Panel:

- Rotor RPM
- Outside Air Temperature
- Total Fuel Used
- Airspeed (boom)
- Airspeed (standard system)
- Altimeter (boom)
- Angle of Sideslip (boom)
- Rate of Climb

Total fuel used was measured by a Potter flowmeter system which actuated the totalizing counter on the cockpit instrument panel.

The following parameters were recorded on a 14 channel Midwestern Model No. 581 oscillograph:

- Pedal Control Position
- Longitudinal Cyclic Control Position
- Lateral Cyclic Control Position
- Collective Pitch Control Position
- Angle of Roll
- Angle of Pitch
- Angle of Yaw

Rate of Roll

Rate of Pitch

Rate of Yaw

Angle of Sideslip

Angle of Attack

Center of Gravity Normal Acceleration

Excitation Voltage

Engineer's Event

APPENDIX III

SYMBOLS AND ABBREVIATIONS

Symbol	Definition	Units
KIAS	knots indicated airspeed	kts
KTAS	knots true airspeed	kts
Vmax	maximum attainable airspeed	kts
Vne	never exceed airspeed	kts
Vmin R/D	airspeed for minimum rate of descent	kts
Vmax R/C	airspeed for maximum rate of climb	kts
Vmin Angle/Descent	speed for minimum angle of descent	kts
Vdive	maximum permissible diving airspeed NOTE: normally demonstrated by contractor	kts
R/D	rate of descent	ft/min
R/C	rate of climb	ft/min
RPM	revolutions per minute	rpm
IGE	in-ground effect	-
OGE	out-of-ground effect	-
C.G.	center of gravity	in.
N_1	compressor speed	rpm
N_2	power turbine speed	rpm
H_D	density altitude	ft
°F	degrees Fahrenheit	deg
°C	degrees centigrade	deg

(THIS PAGE INTENTIONALLY LEFT BLANK)